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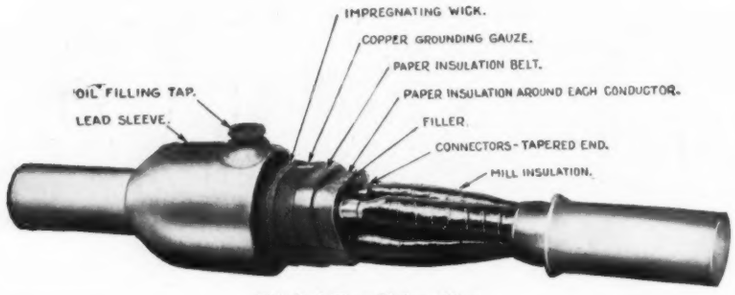

Detailed View Metropolitan
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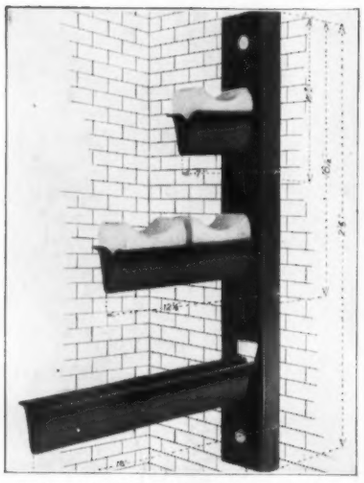

Metropolitan *Subway* Cable Rack with
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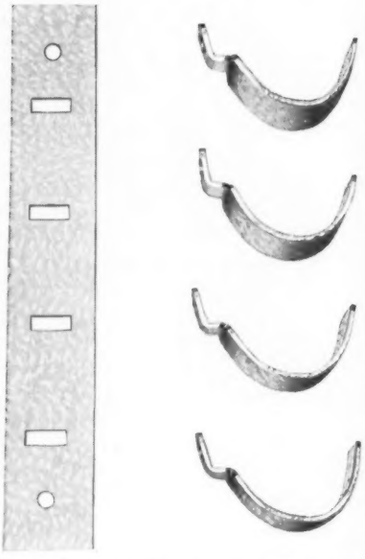

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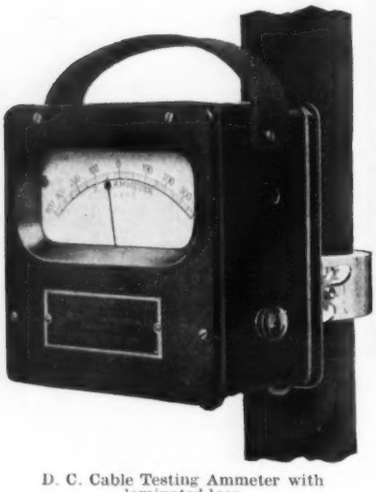

D. C. Cable Testing Ammeter with
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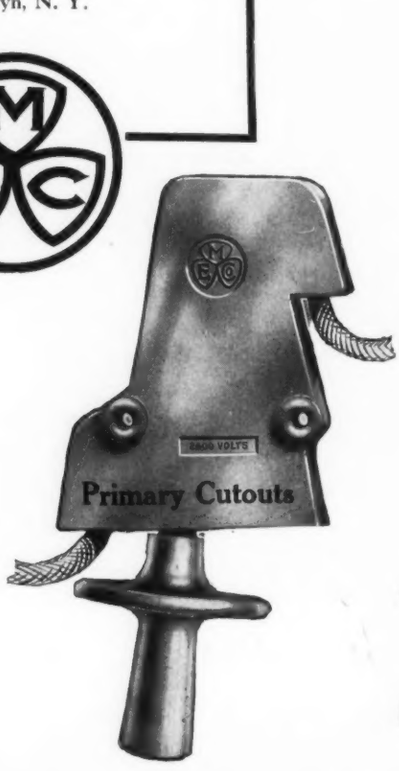

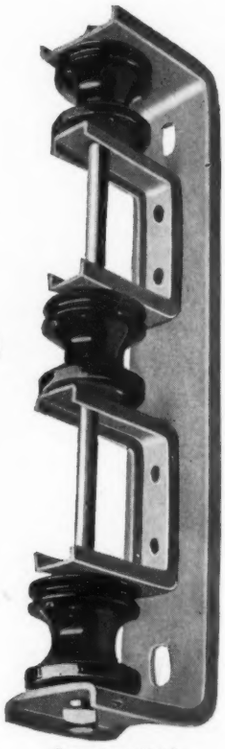

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Electrical World

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HAROLD V. BOZELL Editor

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Why Do We Work?

MEN say that businesses are organized and run for profit. They say that those who labor in them work for pay. But beyond all that — specifically, what is the goal? What has inspired these business enterprises? What are the inner purposes—the ultimate toward which the effort is directed?

In every case analysis will show that the real fruit of such corporate activity is not profit — indeed, the profits are but the wages paid to the capital and brains which must be hired to do the work. The true aim is service. For every organized business has inevitably as its obligation either the saving of labor, the development of economy or the contribution of comforts that will better the conditions of living and bring to mankind more time and opportunity for self-culture, self-expression and the enjoyment of the better things of life. Test where you will and it is so. Any enduring business will be found to have as its far objective some such essential benefit.

Trade, after all, is but the instrument working toward this end, and not the end itself. Management and finance are secondary. The vital purpose is to render service to mankind, and in this there need never be a question as to compensation for all such work well done. America is ever lavish in the rewards she pays for service to the common weal.

What are these services which benefit mankind?

Agriculture is one. Mining is another. The agencies of distribution also render vital service in that they carry to man the urgent necessities of life. Each in turn contributes something fundamental to the well being of the people. The engineer finds his opportunity in his ability to aid in working out the scientific solution of the many problems which beset the way of these great life-giving services. And in this in his turn he himself contributes a further service to mankind that has a value past all estimation.

H. Birchard Taylor

An engineering executive who holds a leading place in the manufacture and development of hydraulic turbines.

TO HAVE been in responsible charge of the manufacture of hydraulic machinery aggregating nearly two million horsepower and at the same time to have been a pioneer in the engineering development of this type of prime mover is an achievement of a kind that few men reach. Only courage, foresight, tenacity and knowledge enabled H. Birchard Taylor to accomplish these results in a very few years after leaving college. Today as vice-president of the William Cramp & Sons Ship & Engine Building Company this young executive continues to make notable contributions to this phase of the electrical industry.

Among the first installations for which Mr. Taylor became responsible were the developments on the New River in Virginia by the Appalachian Power Company and the Keokuk development of the Mississippi River Power Company. The Appalachian development was notable for the distinct forward step which it represented in hydro-electric practice. This comprised the abandonment of the many forms of multi-runner, horizontal-shaft installations then in vogue in favor of the vertical-shaft, single-runner unit of great simplicity and high efficiency. Mr. Taylor was a pioneer in advocating this form of unit, which represents the accepted practice of today in all large installations. The form of setting adopted by Mr. Taylor in the Appalachian development has since been generally adopted for all low-head and medium-head installations, namely, the use of a spiral casing molded in the concrete of the power-house substructure, and in combination with it a so-called "speed ring," or ring of stay vanes, embedded in the concrete and capable of supporting the weight of the superimposed structure. The Appalachian turbines under careful test established a world's record for efficiency. The Keokuk development was probably the largest hydraulic installation which had ever been carried out as a single project, and the turbines were of unprecedented dimensions. Many other installations of first rank have followed, and a high-water mark is represented by the two 70,000-hp. turbines now under construction by the Cramps for the Niagara Falls Power Company.

Mr. Taylor relinquished the office of hydraulic engineer in 1917, having been made vice-president of the Cramp company in that year, but has maintained his active supervision over the hydraulic business of his company, and a number of important inventions have been produced by him during this period. He is president of the Pelton Water Wheel Company and also a director of the Dominion Engineering Works.

Editorial Comment

Electrical World, February 10, 1923

Volume 81 Number 6

The People Want to Know

THE people want to know more about the electrical industry—how big it is in their own town, how it has grown, what it is going to do for them some day. This fact brings an opportunity which every central-station man should eagerly appropriate unto himself. For there is so much to tell, and there is a degree of romance in the tale that makes it fascinating.

But we must remember that the story must be phrased in human terms that paint a human picture. It must not be expressed in technicalities and statistics, for the jargon of our craft means little to outside ears. The mere statement that a utility has spent three or four million dollars in a year means nothing to the average householder and his wife. But a story of what the money bought, and how it will be used, and why it was required, and how much it will benefit in service to the people of the community, does mean something. What the expenditure has effected in terms of visible growth and the number and the kinds of people who have loaned their savings to the company to help finance this community improvement—people are interested in that too. For if it is interpreted to everybody, a better, bigger power station will become as much a matter for local pride as a better, bigger library.

"Experts May Be Found to Justify Any Valuation"

THE editors of this and other technical journals, as well as several engineers of prominence, have at times almost gone out of their way to point out the opportunity and obligation of engineers as a class to undertake to help solve national and international social and economic problems by the application of engineering thinking. Nor is it intended to modify or do else than still more strongly impress that exhortation. But when the editorial page of one of the country's leading daily newspapers states, as a matter of course, that "Experts may be obtained to justify any valuation," it is apparent that the public must gain in some way a greater respect for the engineer as an arbiter or adviser before the engineer is going to be intrusted with the solution of the larger problems mentioned. It is not enough to answer this by saying that "experts" differ because some of them are not orthodox or are urged to become partisan for one reason or another. On the other hand, it is, of course, not practicable, much less within the bounds of probability, for two fair-minded and capable engineers to arrive at an identical result in a valuation. But it is possible and practicable, and it should be the invariable rule, that two engineers shall approach and deal with a valuation in such a way that they arrive at results of the same order of magnitude. Reason should be given to the public for confidence that the engineer approaches his problems in such a way as to find the one answer based on fact or expert judgment, and not as a special pleader or advocate.

Engineers have, by training and in general by practice, the ability and the attitude to reach conclusions based on fact or at least on clear analysis. Modern society, both nationally and internationally, needs that sort of assistance or leadership today. It is the opportunity—in fact, the duty—of the engineer to prove that he can contribute materially to the solution of larger problems. But he must build a sound confidence in the public mind that he is fully able to handle his humbler problems of an economic-engineering-social nature before he will be intrusted with others.

Such statements as the editorial utterance alluded to above are a direct challenge to the engineering profession.

The Search for International Standards

IN THE determination of international standards allowances must often be made for temperamental and national prejudices. Such standards can be arrived at only by voluntary agreement; and we do not all think alike or act alike. To some, standards are commercial, to others technical. It is hard to avoid these differences of viewpoint. Yet there is, as has repeatedly been shown, an opportunity for an agreement which is ultimately to the advantage of all.

At the recent international conference at Geneva it was apparent that the delegates talked from two distinct standpoints on the question of motor ratings. Most of the European nations had proceeded on the belief that motor ratings would follow the I. E. C. recommendation of two years ago, which was that motors should be definitely rated at that continuous load which would produce a temperature rise not to exceed 50 degrees C., and they were still inclined to support that recommendation. The American delegation was somewhat divided in its own ranks, consisting as it did largely of individual representatives holding more or less divergent opinions on the subject, there being, unfortunately, no agreement on the subject in this country before the delegation left. Primarily, our delegates went over as observers, not ready to act on any program. But, as at least one observer has remarked, as the discussion went forward the Americans were naturally drawn into it until finally our differences had a public airing. The British delegation, on the other hand, came with a very definite viewpoint, and with a program built around it, that this old I. E. C. rating had not proved a practical proposition, at least in the case of motors for general distribution and use. Theirs was fundamentally a commercial viewpoint, gained through what they said was instructive experience. The British delegation of thirteen was a unit on the proposition, and eventually a recommendation to the commission was passed based on

the British proposals. (For details see ELECTRICAL WORLD, Dec. 2, 1922, page 1230, and Dec. 23, page 1404.)

Fundamentally, the situation now is that the Geneva conference has recommended that another motor rating standard be authorized in addition to the present I. E. C. standard. According to this recommendation motor ratings will be authorized on the basis of 40 degrees C. rise for continuous operation, with a 25 per cent overload guarantee for two hours without exceeding the I. E. C. maximum temperature limitation (approximately 90 degrees C.), but with the provision that on the same nameplate the rating according to the old I. E. C. continuous (50-degree C.) rating should also be indicated. Fortunately the only apparatus affected by this complicated arrangement is a limited range of motors.

Thus, in the effort to advance international standards, a somewhat awkward and confusing set-up (at least from the standpoint of the general purchaser and user) has been made. It was, perhaps and under the circumstances, the best that could be done, and it has at least brought forcibly to light the fact that international "commercial-engineering" standards cannot be decided solely from a highly technical standpoint, as can absolute engineering or scientific standards such as volts, amperes and similar quantities.

A Present Opportunity for American Leadership in Standards

THE situation as left by the Geneva conference and by subsequent events now presents an opportunity, which is almost a challenge, for America to establish leadership in the question of motor ratings. It should surely serve as a spur to us to reach an agreement in this country on this question. The British, now that they have won their first proposal, hardly know exactly what to do with it, in detail. The principle they fought for was admitted—that there should be recognized a more "generous" motor rating than a rating based on the maximum the motor would do. On this point it is understood the American delegates, as well as those of other nations, all finally agreed with the British. But the actual method of application of the principle is indefinite, or at least undefined to the satisfaction of every one, and it is here that American commercial practicability and engineering ingenuity should step in and assume leadership.

As pointed out last spring by the editors of the ELECTRICAL WORLD and by several others who contributed to the discussion in these columns, it is illogical and uneconomic to continue the present double standard—that is, the two standards (the so-called 40-degree–55-degree and the 50-degree) of rating motors. One single standard, whatever it may be, should be found. As apparently agreed upon at Geneva, the 50-degree standard alone does not seem practicable. The solution would appear to be some standard at a lower temperature, with or without overload guarantee or even mention. Fortunately American manufacturers are fast coming to see that such a solution will be wise. The editors of this paper cannot and do not assume to state what any such actual basis should be, but, considering the 40-degree action at Geneva and considering the simplicity and commercial practicability of a single rating, it appears that an agreement to rate motors "at that horsepower which they will carry continuously without exceeding a temperature rise of 40 degrees" above the surrounding atmosphere would be both sound and practicable. And it seems safe to predict that if American manufacturers and engineers shall agree on some such single standard rating (whether on the exact definition and temperature above stated, or not), they will find themselves better off in their domestic business and also in a most advantageous position to assume world leadership in a final international agreement on motor ratings.

Cost of Living and Electric Utilities

IN THE *Monthly Labor Review* issued by the United States Department of Labor and in the cost of living data issued by the National Industrial Conference Board a great wrong is done to the electric light and power companies of the country. This wrong is not done openly or possibly knowingly, but inferentially, and it is the inference which newspaper headline writers are quick to grasp and play up to our detriment. Why the cost of electric light should be combined with the cost of fuel in the curve "fuel and light," particularly since its effect is almost nil, is somewhat difficult to understand. The injustice is instantly apparent in the statement of the Labor Department that "fuel and light have increased 83.8 per cent in cost from 1913 to September, 1922," whereas its own reports on retail prices of electricity used for household purposes in thirty-two cities of the United States show that the rates for electricity were actually less in September, 1922, than they were in December, 1914. Since 1913 also the improved tungsten lamp has come into wider use, so that light for light the cost is now considerably less.

The National Electric Light Association has very properly taken this matter up with the Labor Department at Washington, and it is to be hoped that the injustice will be quickly righted. Water is more essential to life than artificial light, yet no note is taken of water by the Labor Department, nor of telephone or street-railway service. These have a greater effect on the cost of living than has the cost of electric light.

Important Advances in Street-Lighting Equipment

DREARY standardization of street-lighting equipment has been threatened of late, and therefore it is refreshing to find that a step forward is actually being taken, one in a direction already familiar, the automatic operation of substations combined with outdoor apparatus. The progress referred to has been achieved in Kansas City and is described in this issue by A. E. Bettis.

Time was not many years ago when the suggestion of placing even switches and transformers out of doors was regarded as a dangerous heresy, stamping the engineer who proposed it as a harebrained innovator who should promptly be suppressed lest he break in on the beautiful symmetry of catalog equipment. But the world moves, and as time has gone on more and more apparatus has gone out of doors, sometimes indeed more than under the local conditions might always be desirable. The radical departure in Kansas City lies in placing the constant-current transformers and their immediate equipment on the line poles at convenient outlying points for the supply of the street-lighting circuits. To feed and control these a single 4,000-volt, three-phase, four-wire circuit is run out of each of

seven general substations. The several phases are distributed as 2,300-volt feeders in three symmetrical territories around each substation. In the automatic street-lighting units the line feeder is connected as usual, but is controlled by a time clock which operates the master controller, energizes the circuit and puts the equipment into operation. The same time clock takes the street-lighting circuits off by opening the control circuit and thus checking the activities of that particular feeder. The ordinary constant-current transformer used in this way is rated at 20 kva., smaller units being employed in some of the outlying districts. Each of these 20-kva. installations is good for about forty 600-cp. lamps or a proportionately greater number of 400-cp. or smaller sizes. As there are more than six thousand lamps in all, of which more than half are of 600 cp., the thorough subdivision of the transformer system is self-evident.

This automatic service does two very important things. It eliminates a serious amount of equipment in the substations, necessarily well filled with apparatus for other purposes and, what is even more important, it gets rid of the long and troublesome dead runs of wire on the street-lighting circuits. Any one who is familiar with the complication of laying out street-lighting circuits which have to be operated from one or a few substations will realize the value of pole equipment for handling comparatively short circuits automatically. In this way one can get the maximum number of lamps per actual mile of circuit and avoid contingencies which might put out of action a large portion of the circuit at once.

The other outstanding feature of the Kansas City installation is the underground cable work. The city was not provided with the conduits adequate for the new system even if it had been desired to use them, and it was desired to get rid of overhead wires in so far as this was humanly possible in a growing installation. The difficulty was met by a special lead-covered cable laid over with a triple jute covering impregnated with insulating compound. The chief purpose of the jute covering is to check danger from electrolysis. The cables are paper-insulated, carrying a single No. 8 conductor, and the experience of a year with this cable, of which 750,000 feet are now under ground, has been entirely satisfactory. It is laid directly in earth in a narrow trench 12 inches or 14 inches deep, and at street intersections an additional protection is installed in the form of a 2-inch fiber contact. Special lamp posts are used only where there are no trolley poles handy. Where these are available a special bracket carries the lamp. This arrangement of cable for the underground supply of street lamps has proved to be reasonably cheap. The cost of trenching, placing and filling is running less than 10 cents a foot in clear ground, while the typical total installation cost is reckoned at about 23 cents per foot exclusive of street crossings. Very little trouble has been had with the underground system, and experience indicates that no serious difficulty is to be anticipated.

Of course, the critical period for any such installation is after some years of service, and future results will be watched with interest. Enough has been done, however, to show not only that a thoroughly practical system of automatic pole transformers for street-lighting service can be used but that supply by underground cables laid simply in the earth is here, as it has been proved in various places abroad, an entirely satisfactory means of getting the wires out of the way.

A Plant Investment That Paid

UNTHINKING criticism is sometimes launched at central-station companies on account of the large sums of money invested in plant construction, but when a plant situated within a hundred feet of an exploding gas tank goes through the experience without the injury of a single operating man or the loss of a single second of service over its outgoing lines little remains to be said in defense of substantial construction.

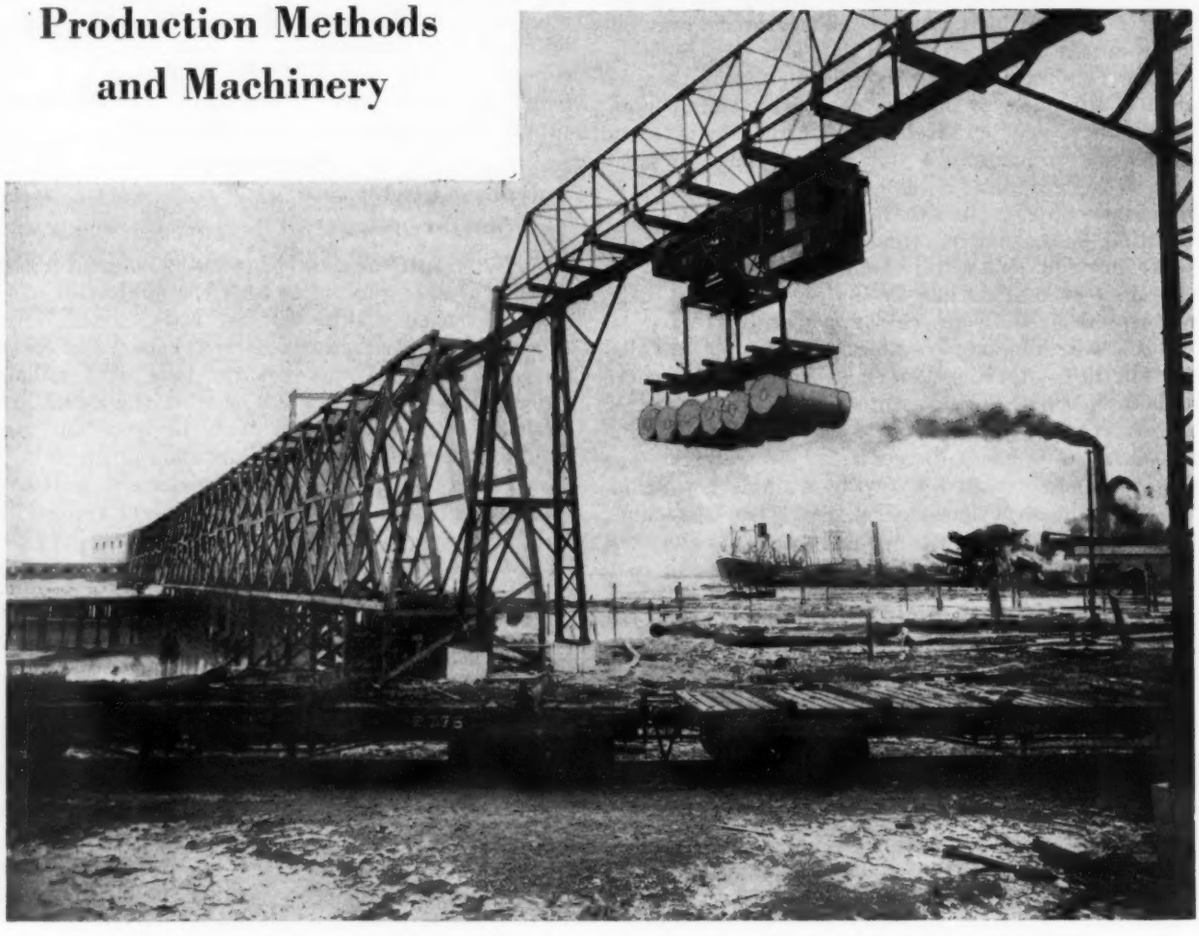
The manner in which the State Street station of the United Electric Light Company of Springfield, Mass., sustained the shock of an explosion in a gas-purifier tank on the opposite side of an intermediate railroad last week speaks volumes for the foresight of the engineers who designed the boiler plant and switch house and justifies the acceptance of their plans by the management of the company against a natural feeling that unnecessary quantities of reinforced concrete were put into these structures. Readers of the "News of the Industry" this week will join in congratulating the United company, its engineers and the Springfield public because the disaster to one great utility was not augmented by the interruption of the service of another, with all the interruption to local activities and the consequent loss and suffering which such a calamity would have entailed. Once more "safety first" has proved itself the most economical policy.

Polyphase Circuit Measurements

THE proper method of making measurements on polyphase circuits has been the subject of considerable discussion within the last few years. With balanced circuits the methods are well known and commonly accepted, but this was not the case with unbalanced circuits. It was recognized that if the definition and methods of measurements were to have any assured standing they should cover unbalanced circuits. The present extensive use of the two-element wattmeter is incontrovertible evidence of the general recognition of the importance of unbalance in polyphase circuits; but the devices corresponding to the polyphase wattmeter were not developed for measuring power factor and reactive power on unbalanced circuits.

Recently a new system of measuring devices particularly applicable to unbalanced circuits has been proposed. These devices, which are described this week in an article by R. D. Evans, are relatively simply and employ standard types of instrument transformers and meter or relay elements, with an auxiliary network of resistors and reactors. Some of the advantages of the proposed system of measuring devices are discussed in the article by Mr. Evans and others in the paper on "Polyphase Power Measurements" to be presented by C. L. Fortescue at the midwinter convention of the American Institute of Electrical Engineers. The future of this new system cannot be predicted until the commercial instruments have been completely developed. It may be that measuring devices of this character will supplement and to an extent replace present systems. The principle, however, offers opportunity for immediate application to special polyphase motor installations in order to protect equipment from injury through single-phase operation.

Paper Industry Utilizes Modern Production Methods and Machinery



The consumption of paper for all purposes requires immense mills and a great amount of power machinery. The accompanying views show the mill and log pond of the Washington Pulp & Paper Corporation at Port Angelus, Wash., on Puget Sound. A monorail system is used for carrying the finished paper rolls from the mill to the dock. In the mill itself are found sectionalized electric drives on the paper machines and numerous other applications of electrical equipment used to secure reliable and continuous production.

New Practices in Street Lighting

Pole-Type Transformers Used in Kansas City to Reduce Substation Equipment to a Minimum —Installation Conditions Required Underground Cable of Special Type—Features of Lamps—Standard Construction Used on Overhead Circuits

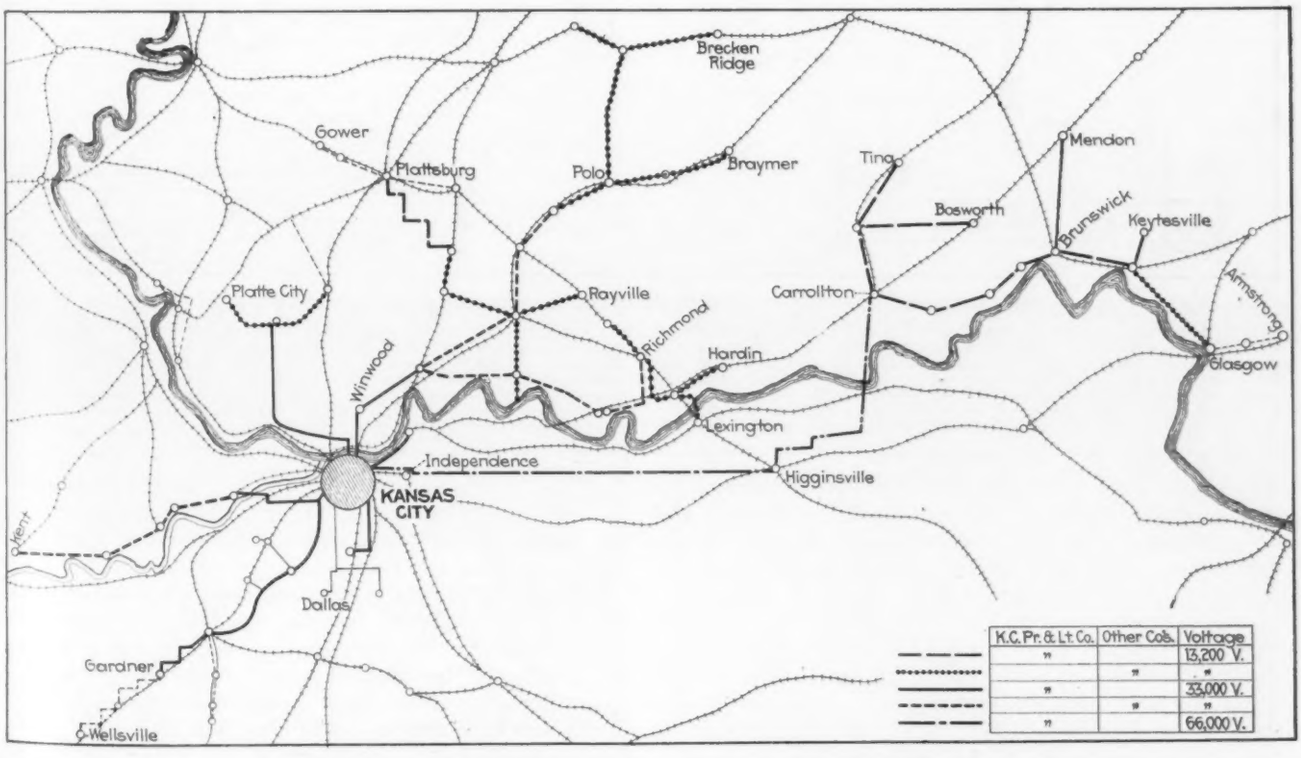
By A. E. BETTIS

Superintendent of Distribution Kansas City Power & Light Company

TWO radical departures have been made in the installation of a new street-lighting system in Kansas City, Mo. These are the removal of all street-lighting equipment from the substations, except one complete three-phase circuit switching equipment in each of seven substations, and the placing of a large part of the lamp circuits underground, a special cable buried in the earth without ducts save at street crossings being used. Ducts are used at street crossings to facilitate repairs in case of cable burnouts or other breakdowns. The removal of all of the usual series transformer and switching equipment from the substations means the saving of a great amount of valuable space and in some cases obviates the necessity of special substations for the street-lighting equipment. This in itself has meant a material saving in expense. The placing of the series circuits underground has enabled the use of a simple and attractive ornamental post on streets where there are no street-car lines. On the streets with street-car lines and steel trolley supports a simple type of ornamental bracket has been utilized for mounting on the trolley poles, the conductors being carried overhead. The plans which were followed made possible the removal from the streets of many of the unsightly wiring and lamp supports that overhead construction usually involves. These results have been attained because it was possible to start with a comparatively clean slate, much of the previous street lighting having been with gas.

Series-type constant-current transformers mounted on the line poles at points most convenient to the territory to be served are utilized throughout, thus removing all series equipment of any character from the substations. To control the series transformers one three-phase, 4,000-volt, four-wire, 60-cycle grounded-neutral circuit is run out of each of seven substations. The constant-current transformers are connected to these circuits in the same manner as the ordinary distribution transformers, care being taken to balance the phase loads. The usual oil-switch and relay equipment for a supply circuit is provided for the control panel of this circuit.

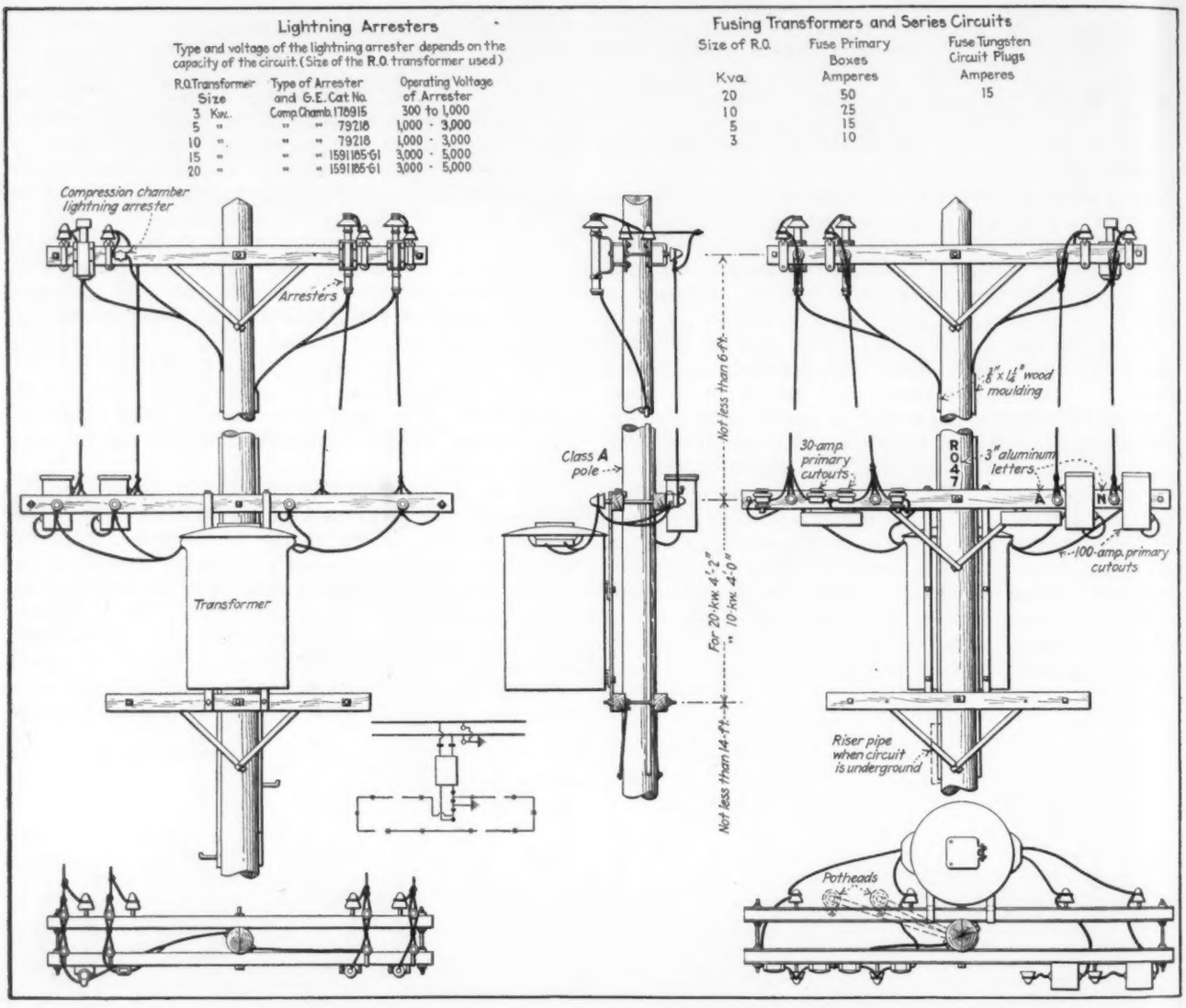
The A, B and C phases are distributed one in each of three territories around the substation serving a particular section. Each of the single-phase, 2,300-volt feeders is connected through knife disconnecting and oil switches to the station bus. The oil switches are single-element type, remote-controlled, with a separate inverse-time-element relay on each phase. In the automatic stations serving street-lighting circuits the street-lighting feeder is connected to the bus the same as in manually operated substations. The control, however,



LAYOUT OF TRANSMISSION CIRCUITS IN THE TERRITORY ADJACENT TO KANSAS CITY

is different. The circuits are put into and taken out of operation by a time clock which closes the control circuit and in turn operates the master controller, which then rotates to the position of the street-lighting feeder and energizes the control circuit closing the feeder oil switch. Relays are provided for tripping out the circuits in case of trouble. If any single-phase feeder is tripped out, a motor timer is put in operation. This motor timer will close the oil switch three times, hesitating approximately eight seconds, thirty seconds and one and one-half minutes before reclosing. This is accomplished by contact arms, rotating on a dial, which are spaced to give the desired time. Lock-out relays, one on each phase, open the control circuit for reclosing the oil switch and prevent any further operation on this feeder until the lock-out relays are set by hand. The street-lighting circuits are taken out of service by the time clock opening the control circuit and preventing any further operation of the feeder.

The foregoing arrangement obviously accomplishes two things. The first is the elimination of a mass of station equipment requiring valuable space, and the second is the elimination of dead runs of wire to reach lamps a long distance from a substation. The series transformers can be so placed as to obtain the shortest possible series circuit mileage, and the three-phase circuits pick up load at the point where they leave the substation.


Lightning Arresters
Type and voltage of the lightning arrester depends on the capacity of the circuit. (Size of the R.O. transformer used)
R.O. Transformer Size
Type of Arrester and G.E. Cat. No.
Operating Voltage of Arrester
3 Kw. Comp. Chamb. 178915 300 to 1,000
5 " " " 79218 1,000 - 3,000
10 " " " 79218 1,000 - 3,000
15 " " " 1591165-G1 3,000 - 5,000
20 " " " 1591165-G1 3,000 - 5,000
Fusing Transformers and Series Circuits
Size of R.O. Kva.
Fuse Primary Boxes Amperes
Fuse Tungsten Circuit Plugs Amperes
20 50 15
10 25
5 15
3 10
Compression chamber lightning arrester
Arresters
Transformer
Class A pole
Not less than 6-ft.
For 20-kw. 4'-2"
" 10 kw. 4'-0"
Not less than 14-ft.
3" x 4" wood moulding
30-amp. primary cutouts
3" aluminum letters
R 047 A N
100-amp. primary cutouts
Riser pipe when circuit is underground
Potheads

STANDARD CONSTANT-CURRENT TRANSFORMER INSTALLATION AT KANSAS CITY

All substation equipment is eliminated except that required to control one 4,000-volt, four-wire, neutral-grounded, three-phase, 60-cycle circuit from each of seven substations. These installations are connected to the supply circuits in the same manner as ordinary customers' transformers, the supply circuits being switched at the proper time, either manually or automatically, depending on the type of substation from which they come. A standard size of 20 kva. has been adopted for use, the other sizes being used only under special conditions, such as in slow-growing outlying districts or small towns. In a few special situations where it is not practicable to run special supply circuits the installation is controlled by a time switch and connected to the regular service circuits. This type of series transformer installation eliminates a great deal of substation equipment.

For city use constant-current transformers rated at 20 kva. are standard. Lower ratings, down to 3 kva., are used in small towns or outlying districts where development has not proceeded far. Where the smaller sizes are used there are a few cases in which the individual installations are controlled by a time switch on the pole as they are too far away or too scattered to justify the installation of a three-phase circuit for street lighting only. It is expected that these installations will be changed to the standard size and to substation control as the territory in which they are located develops.

BEFORE AND AFTER IMPROVING STREET LIGHTING ON HARRISON STREET SOUTH OF ARMOUR IN KANSAS CITY

Each transformer installation is protected by primary and series circuit fuses. Expulsion-type fuses are employed for the primary side, and the ordinary porcelain cut-out used on 2,300-volt service circuits is employed for the series circuit. In addition, two of the same type of cut-outs are placed on the circuits with the plug normally out, so that the circuit may be grounded on either side for test purposes. Compression-type arresters are used on each installation. Separate grounds through driven pipes are provided for lightning-arrester and test purposes. On the 20-kva. installations the normal number of 600-cp. lamps used is forty, while sixty to sixty-five 400-cp. lamps are used on the same size of transformer. The 600-cp. lamps are of the 20-amp. type. The 400-cp. are 15 amp. The 250-cp. lamps are 6.6 amp., no transformers between the lamps and the circuit being used for these.

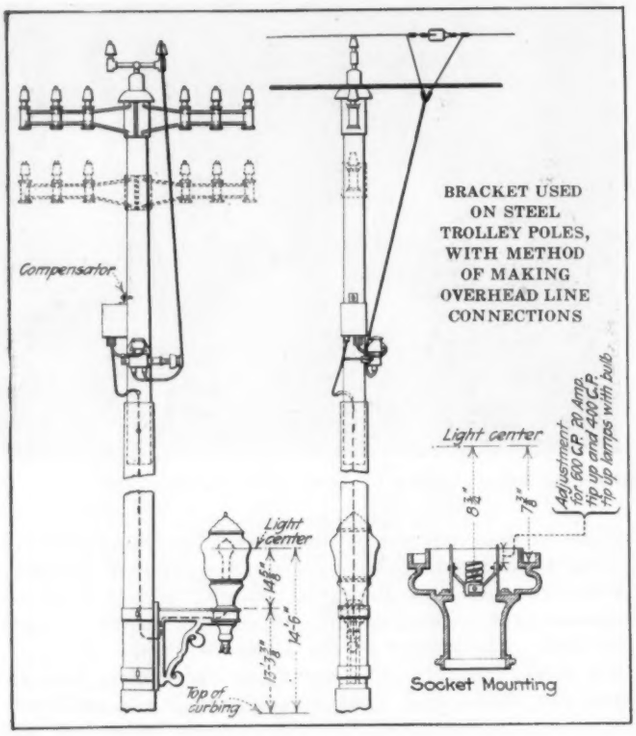
Each installation is provided with the markings necessary to identify it, so that record checking and inspection is easy. The standard marker board indicates the substation (*P* is the symbol); *S* indicates that it is a street-lighting circuit, and the number is the number of the circuit. On the primary side the circuit number and the indication that it is a street-lighting service circuit is given. The *RO* number is that of the transformer installation.

Several knotty questions were involved in the selection of cable for the underground work. Duct work except at points like street crossings under pavements, where to save expense of installation tunneling was resorted to, was out of the question on account of expense. Armored cable was the first thought, but it involved expense that in Kansas City experience hardly seemed justified. The theory of the armor is that it will prevent street laborers from damaging the cable. Experience has shown that a laborer digging into a cable not only tears off the armor but often takes a considerable portion of the cable with it or damages it so that it must be replaced. The cable finally adopted is easily cut through and damage is thus limited to short pieces. The danger of electrolysis prohibited the use of a plain lead-covered cable, even though this danger is materially lessened by the facts that the cables between lamps are thoroughly insulated from each other and that the total length of any run is very short.

STREET-INTERSECTION LIGHTS OF THIS TYPE ARE PLACED ON THE STREET-LIGHTING CIRCUITS

The cable finally selected is lead-covered and has in addition a triple jute covering heavily impregnated. This is expected to provide sufficient insulation to pre-

BEFORE AND AFTER ON ARMOUR STREET EAST OF BROADWAY


BRACKET USED ON STEEL TROLLEY POLES, WITH METHOD OF MAKING OVERHEAD LINE CONNECTIONS
Compensator
Light center
Adjustment for 600 C.P. 20 Amps. 1 lp up and 400 C.P. 1 lp up lamps with bulb
Light center
Top of curbing
Socket Mounting

vent damage from electrolysis to the short runs of cable used. The single No. 8 A. W. G. conductor is insulated with $\frac{3}{32}$ in. of saturated paper. An objection that will be raised is the immediate possibility of trouble on such a cable in case moisture enters it. It is felt, however, that this is an advantage rather than a drawback. With rubber-insulated cable it has been found that moisture entering the cable may not become apparent for some time, and by the time it is evident considerable sections of the cable may be damaged and have to be replaced. With the paper-insulated cable the entrance of moisture means an immediate blow-up which affects only a short length of cable. The defective section can be cut out, the cable dried out and a new section put in. The trouble is then over, which might not be the case with a rubber-insulated cable. Another criticism that has been made is that a single conductor inside a metal sheath is likely to give rise to serious inductive effects. Careful tests and the experience of a year have failed to show any. The cable, of which 750,000 ft. has so far been used, has withstood repeated tests at 15,000 volts.

The cable is buried directly in the earth. A narrow trench about 12 in. to 14 in. in depth is dug and the cable laid in. At street intersections where pavements are encountered trenching was first undertaken, but later tunneling and the installation of 2-in. fiber conduit was resorted to to reduce the expense. On high-class paving the cost of paving repair is a serious item.

TYPES OF STREET LIGHTING USED—THE LARGE VIEW SHOWS A STEEL TROLLEY POLE; IN THE INSET, AN ORNAMENTAL POST

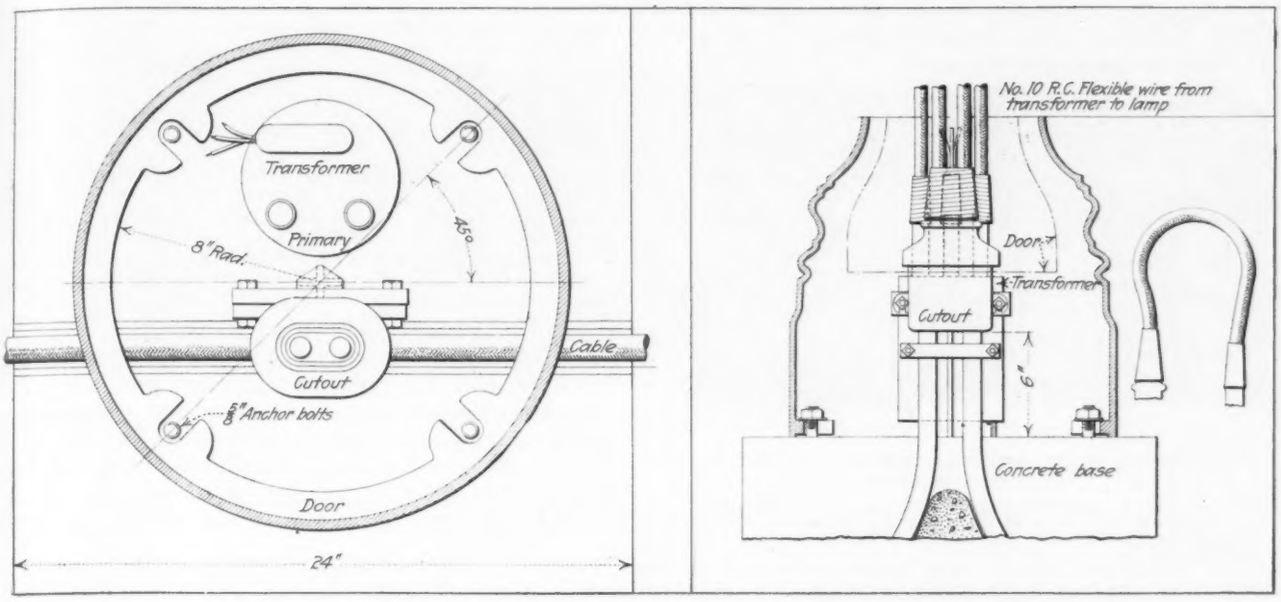
CONSTRUCTION EMPLOYED FOR LAMP SUPPORTS

At present there are 6,206 lamps installed, of which 3,706 are rated at 600 cp. Twelve hundred and twenty-five of these are installed on ornamental posts and 2,311 on brackets mounted on trolley poles. There are still 3,781 250-cp. lamps to install on trolley-pole brackets, and it is expected that before long the total number of lamps on the system will reach 12,000. The cast-iron ornamental post used is shown in an accompanying illustration. A No. 107 "Novalux" unit with form T6 "Novalux" top is used with the 600-cp. lamps. No. 109 unit is used with an ornamental post. In the majority of cases the lamp posts used bring the center of the lamp $14\frac{1}{2}$ ft. above the ground, though in one residence district a post with a distance of 11 ft. to the center of the lamp is employed. This is to meet a special condition and is not recommended as a regular practice.

In the base of each lamp standard is a cut-out bolted to a metal support anchored in the concrete. Alongside this support is a transformer with leads running directly to the cut-out. The cut-out is made up of a cast-iron jacket and a porcelain top carrying the contacts. The cables are sealed into the bottom of the cut-out with compound so that the cable sheaths are insulated from each other. The form of construction is such that in case of an accident which tears the post down there is little chance of an injury to the cable, since the top of the cut-out merely pulls out and the pole and transformer may be jerked free of the foundation without putting any strain on the cable. This has already happened in several instances without any disturbance to the cables. Moreover, in case work must be done on the installation a dummy top may be put on the cut-out and the pole and all other parts removed without affecting the rest of the installations in service. Any live parts are thoroughly protected.

Generally there is only one transformer installed in these post bases. However, to take care of lights placed in the street to give warning of street intersections arrangements are made for the installation of a second cut-out in the base of the nearest post, and the circuit for this lamp is carried underground to the center of the street. This makes these warning signs a part of the regular street-lighting system.

For trolley-pole installations a special bracket is used



CONCRETE FOUNDATION AND ARRANGEMENT OF TRANSFORMER AND CUT-OUT

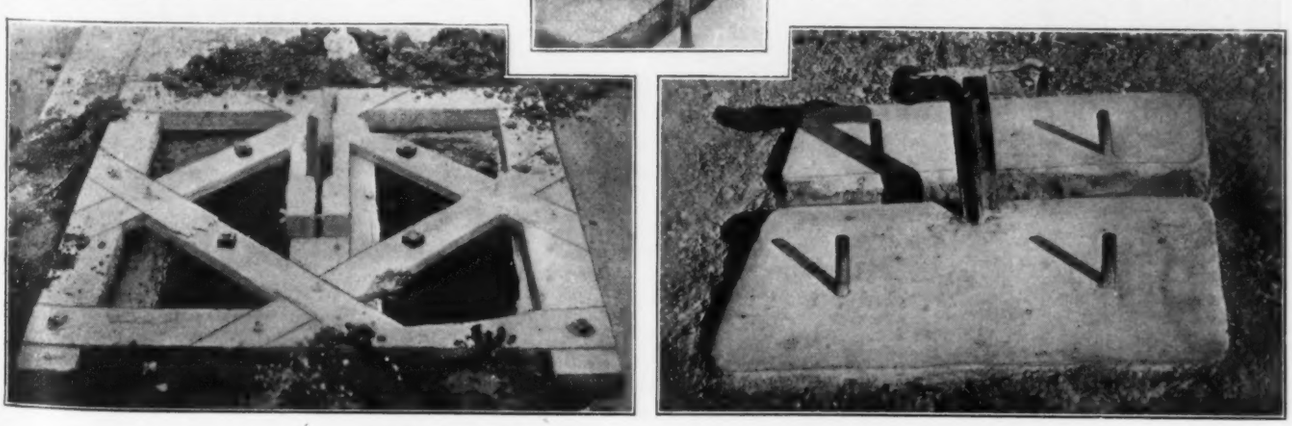
which involves no novel features. Care has been taken to get the best possible appearance. For these installations the conductors are run overhead on the trolley poles and the compensators and cut-outs are mounted on the poles above the bracket, the lamp conductors being taken from the compensators to the interior of the pole and thence to the bracket.

Some Installation Costs

A variety of conditions had to be contended with so that no statement of average costs would have any meaning. A few costs under specific conditions may, none the less, be of interest. A number of the ornamental posts had to be installed in places where it was necessary to place the conductors in channels cut in concrete walks In a typical case of this kind the cost of the post installed complete, including wiring, labor and all materials up to the cable, was $131. Anchor bolts were used in the sidewalks to hold the post in place. The installation of cable in the sidewalks, including the cable itself, channeling and the repair of sidewalks, cost approximately 43 cents per foot. Where posts were installed on concrete foundations set in earth the cost complete, including the foundation, ran about $130. The labor cost of installing the foundation and the cut-out in these cases was approximately $12, including excavation. In a typical instance of cable installation which covers a lot of about 12,000 ft. the cost was slightly over 9 cents. This was for the labor of trenching and the cost of placing the cable as well as for replacing sod and otherwise repairing the parking in which the cable was laid. A typical installation cost for cable installed complete is approximately 23 cents per foot. The street crossings where high-grade pavement was excavated cost approximately $2.26 per trench foot complete, including the 2-in. fiber conduit and cable used and the repairs to the pavement. In the outlying districts with the cheaper type of bitumen pavement this cost was approximately $1 per foot.

A large part of the present installation has been operating for nearly a year. In that time almost no trouble has occurred outside of accidents incident to traffic, as where posts are run into and knocked down. One case of trouble with a cut-out due to a loose connection has been recorded. In several instances laborers employed on other street work have dug into and done minor damage to cable.

The ordinance under which the work of

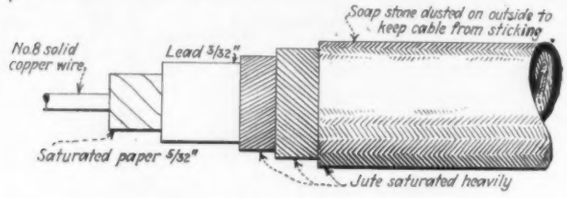


PHOTOGRAPHIC DETAILS OF INSTALLATION PRACTICES

installing the system was carried out was passed in May, 1921. It provides the following schedule of prices for the various types of lamps used:

For 600-cp. series street lamps, equipped with "Novalux" units, supported by posts at an elevation of 14 ft. 6 in. from the ground and supplied from underground circuits, necessitating channeling or excavation in sidewalks in order to install the necessary underground cable; price per lamp per annum, $78.

For 600-cp. series street lamps, equipped with "Novalux" units, supported by posts at an elevation of 14 ft. 6 in. from the ground and supplied from underground circuits, necessitating channeling or excavation in grass plats in order to install the necessary underground cable; price per lamp per annum, $67.


Soap stone dusted on outside to keep cable from sticking
No.8 solid copper wire
Lead 3/32"
Saturated paper 5/32"
Jute saturated heavily

TYPE OF CABLE USED FOR UNDERGROUND STREET-LIGHTING CIRCUITS

The ordinary type of armored cable used for burial directly in the earth did not seem to offer enough protection against mechanical injury to justify the expense. This cable with a heavily impregnated jute covering outside the lead was used, and for protection against electrolysis troubles dependence is placed on this covering and the fact that the cable is broken at each post and the sections thoroughly insulated from one another.

For 400-cp. series street lamps, equipped with "Novalux" units, supported by posts at an elevation of 14 ft. 6 in. from the ground and supplied from underground circuits, necessitating channeling or excavating in sidewalks in order to install the necessary underground cable; price per lamp per annum, $69.

For 400-cp. series street lamps equipped with "Novalux" units, supported by posts at an elevation of 14 ft. 6 in. from the ground and supplied from underground circuits, necessitating channeling or excavating in grass plats in order to install the necessary cable; price per lamp per annum, $58.

For 600-cp. series street lamps, equipped with "Novalux" units, supported by brackets on trolley poles and supplied from overhead circuits; price per lamp per annum, $57.50.

For 400-cp. series street lamps, equipped with "Novalux" units, supported by brackets on trolley poles and supplied from overhead circuits; price per lamp per annum, $48.

For 600-cp. series street lamps, suspended from mast arms attached to wooden poles and supplied from overhead circuits; price per lamps per annum, $55.

For 250-cp. series street lamps, suspended from mast arms attached to wooden poles and supplied from overhead circuits; price per lamp per annum, $34.

For 100-cp. multiple street lamps, supported by posts and supplied from underground circuits; price per lamp per annum, $24.

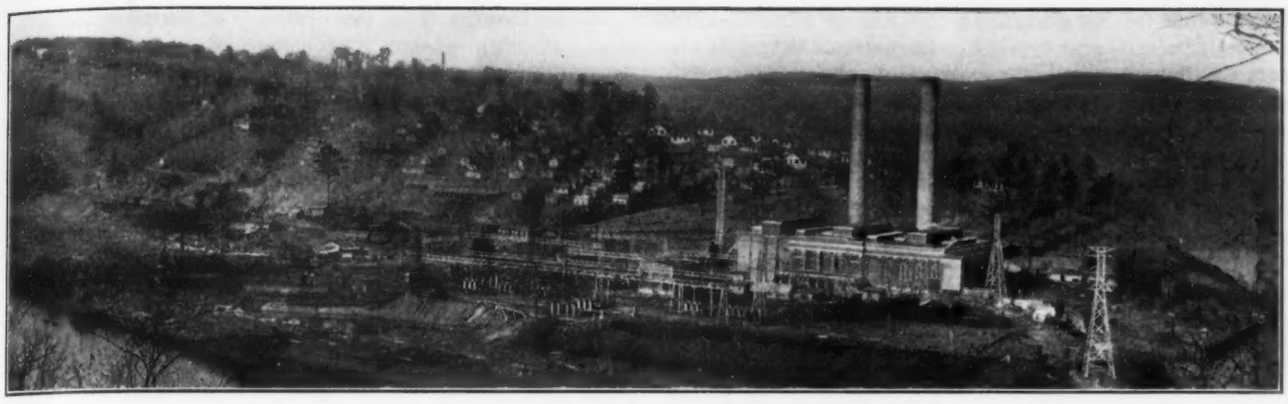
For 100-cp. street lamps used in "traffic standards," now installed or to be installed by the city at street intersections: In case the city shall furnish, install and maintain at its expense all "traffic standards" referred to in this class of street lighting the company shall extend its lines to supply such street lamps and will at its expense maintain the lines, supplying the light and the incandescent lamp; price per lamp per annum, $30.

In this contract the city has the option of purchasing at the end of ten years or any other five-year period thereafter the entire plant, property and equipment devoted exclusively to the furnishing of street-lighting service at the cost to the company less the accumulated depreciation at an annual rate of 3.5 per cent per annum at the time the option to purchase is exercised.

CITY TO ALLOW DEPRECIATION

Accumulated depreciation shall be reduced to the extent of any reinvestments of depreciation reserve made by the company in its plant used for street-lighting service to the city. Deferred maintenance, if any, shall be considered at the time of purchase. The term "cost to the company" is specified as meaning the original construction cost of the plant and property devoted exclusively to street-lighting service, including a percentage to be agreed upon by the parties at the time of purchase to cover the cost of organization and legal expenses, engineering, interest, insurance, taxes and injuries and damages during construction. No allowance will be made in the purchase price for going value, franchise value, cost of promotion, bond discount, brokerage commissions, development losses or operating losses. The price to be paid for lamps is to be based on the cost of the posts and glassware used. Any price in excess of this will call for an adjustment of the rates. The city has the right to select the posts, brackets and glassware to be used.

TRENCHING FOR STREET-LIGHTING CABLE



GORGAS STEAM STATION OF THE ALABAMA POWER COMPANY

Salvaging a War Contract

How the Gorgas Steam Station, Erected by the Government on the Warrior River, Has Continued to Function and to Serve the Interconnected Network and Industries of the Southeast with Power

By R. D. COOMBS*
Consulting Engineer, New York

THE extension of the Gorgas steam plant on the Warrior River in Alabama was made by the War Department to assure an early and adequate supply of power for the construction and operation of the United States nitrate plant then being built at Sheffield, Ala.

When the government, as a war measure, decided to construct the air-nitrate plants at Sheffield, in order that a war necessity might be guaranteed, a very important factor to be worked out in conjunction therewith was the source of the supply of electric power for construction purposes and a guarantee that such power would be available very promptly. For the government to depend on any water power from Muscle Shoals was out of the question, as was also dependence on the completion of new steam-power facilities at Sheffield. It would have involved a delay of several years if the construction of the nitrate plant had awaited the building and completion of water-power plants at Muscle Shoals, and to have delayed the construction of the nitrate plants pending the building from the ground up of a complete steam plant at Sheffield would have involved delay for a period of more than one year.

The Alabama Power Company at this time was operating a large hydro-electric plant at Lock 12 on the Coosa River, Alabama, and this plant was connected by high-tension transmission lines to its steam plant at Gadsden, Ala., and to its much larger steam plant at Gorgas on the Warrior River, the latter plant being approximately 90 miles south of Sheffield. The Gorgas plant was an exceptionally efficient one as the power company owned and operated its own coal mines at the plant and was thus able to avoid the heavy freight charge which ordinarily constitutes a large proportion of the cost of coal for steam-power plants.

As the Alabama Power Company therefore owned and operated a large and dependable power producing and distributing system throughout Alabama, situated less than 100 miles from the proposed nitrate plants at Sheffield, it was a logical conclusion for the government to call upon the power company to supply quickly the power needed to permit of the rapid construction of the all-important nitrate plant.

EXTENSION OF GORGAS STATION

When the Alabama Power Company built its Gorgas plant provision for future extension to a capacity approximately three times the capacity as first installed was made by expenditures for extra land, foundations, water intakes and discharge culverts. It was therefore possible to make a very important saving in time by utilizing the work already done.

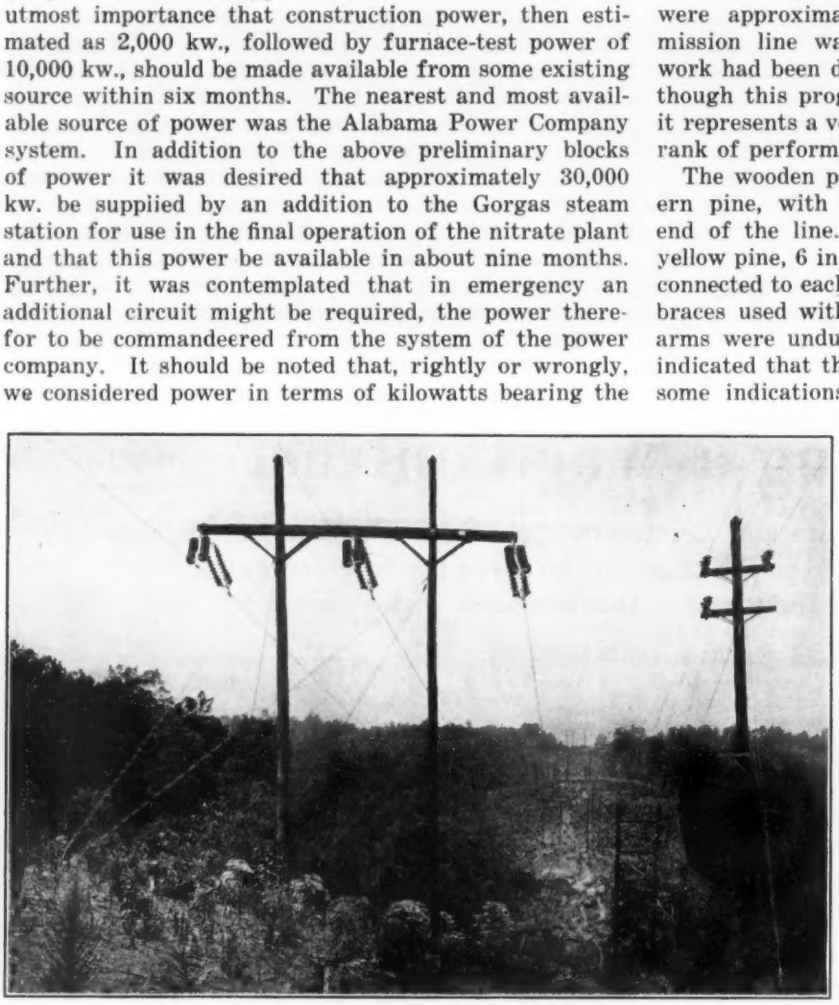
The War Department decided that the best and quickest way to obtain both the power needed immediately and also a portion of the total subsequent power was to build a high-tension transmission line from the existent facilities of Gorgas to the proposed nitrate plant at Sheffield so that power would be available from the power company's system in the course of a few months, and also to install additional equipment in the spaces previously provided in the steam plant at Gorgas. As it was impossible for the power company to raise the necessary funds by financing in the ordinary manner, owing partly to the war emergency control of the government which prohibited the financing of projects of this nature, the government contracted with the power company, as its agent, to install the extensions at government expense, with the agreement that the power company should have the right to purchase at some future time at a fair value the improvements paid for by the government.

Ordinarily a 110,000-volt, 30,000-kw. transmission line, with provision for additional circuits and situated in rather rough country, would be built with long-span steel towers and would be intended as a permanent installation.

The known facts governing the Gorgas-Sheffield line

*Major Coombs was the officer in charge and agent of the contracting officer in the Alabama Power Company contract.

at the time of its design, in the winter of 1917-1918, compelled a different type of construction. It was of the utmost importance that construction power, then estimated as 2,000 kw., followed by furnace-test power of 10,000 kw., should be made available from some existing source within six months. The nearest and most available source of power was the Alabama Power Company system. In addition to the above preliminary blocks of power it was desired that approximately 30,000 kw. be supplied by an addition to the Gorgas steam station for use in the final operation of the nitrate plant and that this power be available in about nine months. Further, it was contemplated that in emergency an additional circuit might be required, the power therefor to be commandeered from the system of the power company. It should be noted that, rightly or wrongly, we considered power in terms of kilowatts bearing the stamp U. S. A. and available at any or all times, 100 per cent capacity, twenty-four hours a day, if needed.



A 110,000-VOLT LINE ADJACENT TO A 44,000-VOLT LINE ON THE SAME RIGHT-OF-WAY

In the circumstances the writer decided in favor of wooden poles, first because the steel market was facing a chaotic condition and no delay was permissible, and second because the life of the line was uncertain. The Muscle Shoals dam project had not then been authorized. It was also possible to construct a long span, H-frame one-circuit line and duplicate it if necessary without interruption to service.

DETAILS OF TRANSMISSION LINE

Right-of-way was comparatively inexpensive, and the right to trim outside the right-of-way was readily obtained. Therefore the structures were placed near the sides of the 100-ft. width of way, with a small side clearance, the center being reserved for a 44,000-volt existing circuit to Jasper and for the government telephone line. The route of the line lay through rough, scrub-timbered, undeveloped country with very poor roads and these not often parallel to the right-of-way. Cutting and clearing began in January, 1918, during what was said to have been one of the worst winters of local record. The line crews, scattered in from three to six camps along the route, suffered considerably from the cold and wet, the negroes being particularly susceptible to pneumonia.

In five months from the ordering of supplies and the start of right-of-way purchase and clearing, which were approximately simultaneous, the 90-mile transmission line was ready for service and considerable work had been done on the permanent substations. Although this progress is not offered as record-breaking, it represents a very intense effort and is entitled to high rank of performance in view of the conditions.

The wooden poles used were mostly creosoted Southern pine, with some Western cedar in the northern end of the line. Cross-arms were creosoted long-leaf yellow pine, 6 in. x 8 in. x 29 ft., with a grounding wire connected to each insulator eyebolt. In view of the angle braces used with these arms it might appear that the arms were unduly large, but experience with this line indicated that they were not too large since there were some indications of bending in the arms. It seems probable that suspension braces instead of compression braces might eliminate this tendency.

It may be noted that the horizontal separation of conductors on tangent suspension frames is 14 ft., which is less than will be required by certain recent specifications, and that thus far no failures have resulted.

The power-house construction presented no unusual difficulties, as it was essentially an extension of an existing station by the addition of a boiler house, a 30,000-kw. turbine and accessories, though it is perhaps unusual in the East to have to convey all materials and equipment by river barge 18 miles from the rail head.

GORGAS SUBSTATION

The Gorgas substation was designed to make the Gorgas-Sheffield line an integral part of the power system so that in any apparent combination of conditions it would be possible to obtain power from the government unit, the Alabama Power Company unit or the system or connections of the power company.

The substation design followed the usual lines of a high-voltage latticed-steel structure with concrete foundations. An incident occurred in connection with this substation indicating the rapid action of corrosive agencies. In the incidental filling in of low ground adjoining the river with hot ashes from the boiler house the ashes were dumped close to the guard fence and to one of the supporting columns of the substation. Either rain or fog from the river, acting in conjunction with the fumes from the ashes, started a very noticeable corrosion first of the galvanized-wire fence and then of the painted column.

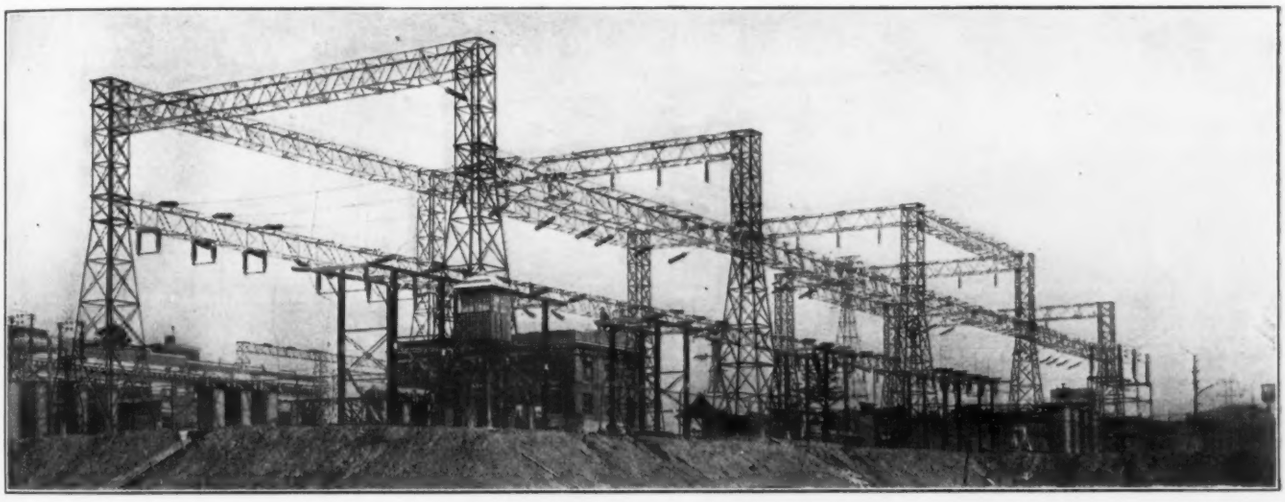
CONTRACT WITH ORDNANCE DEPARTMENT

Under the contract the Alabama Power Company, as an agent of the United States, was in about the position of an engineering-contracting concern doing work under the supervision of an owner. However, the position of the agent was different from that of the peacetime contractor, since all purchases were made after the specific approval of the Ordnance Department, and the Ordnance Department inspected and paid for them. On the other hand, the agent was in fact adding to an

operating station of its own and expected ultimately to purchase the government's construction. Further, the contract contained a limit to the fee to be paid the power company for service, etc. Under the circumstances it is hard to discover a reason why either the power company or the Ordnance Department should have had any tendency to follow a course other than the one pursued—to build a workmanlike job as fast as possible.

After the haze of accusation and counter-accusation arising from the supply contracts of the war, it is interesting to be able to discern at least one type of such contracts which now appears to have had a relatively high salvage value from the standpoint of the public interest. Further, it would appear that the ultimate benefit will be greater than was to be foreseen at the beginning of the contracts in question.

Starting from the premise, which was partly the understanding if not indeed the law of the appropriations, that the war supply expenditures were temporary expenses rather than permanent governmental underwritings, it yet appears that the public utility type of construction contract was in fact a permanent improvement in the public interest. On the other hand, it might be said—indeed, it was said—that there was no sure peacetime need of such additions and that there would be no market for the power until a long time after the war.



OUTDOOR SUBSTATION OF ALABAMA POWER COMPANY

Peace-Time Utilization of Station

In a certain section before the war there was no interconnection or transfer of power. Compare that situation with the power and textile companies of Georgia and the Carolinas joining in a petition to the government to lease the Muscle Shoals power plant to the Alabama Power Company so that company could transfer power to their communities. During the war the impetus to interconnection was greatly strengthened, and the Alabama power and Georgia power companies were afterward connected through a 50-mile transmission line. Next the Alabama Power Company found it necessary and desirable to rent the use of the government power station at Gorgas, which was an extension of its own station at that point, and then to rent the government station at Muscle Shoals. Along came the coal strike, and Alabama, a coal state, needed electric power to replace the coal which was not being mined. On top of the coal strike came the driest year, in a hydro-electric sense, that region had ever known and a pressing need for public utility service and the power to transfer service. As a result the industries of the Southeast clear up to North Carolina were depending to a very considerable extent upon the usefulness in public utility service of the War Department's contracts.

The Gorgas project has already made a return to the government and to the public and stands out above the ordinary war-time contract in the value of this return and also in the relative salvage value of the plant. Operated as it has been, in co-ordination with the large power-producing facilities of the Southeast, it has been a means of accelerating the growth of industry, and, particularly in the past two years of low water flow in the rivers, the operation of this plant and the distribution of the energy to the states of the Southeast, has permitted the operation of numbers of cotton mills which otherwise would have closed down and thrown their employees out of work.

It is the writer's understanding that the Alabama Power Company has made an offer to the government to purchase for cash the portion of the Gorgas plant now the property of the government and has agreed to pay a sum which is equal to or greater than the present construction cost of these facilities. An income to the government in the form of rental for the use of its Gorgas project, the great benefit to industry throughout the South, which otherwise would have been compelled to curtail operations, and the salvage value of the plant as measured by the offer of the power company under the contract to buy it for cash, are among the benefits which have accrued to the government and to the public.

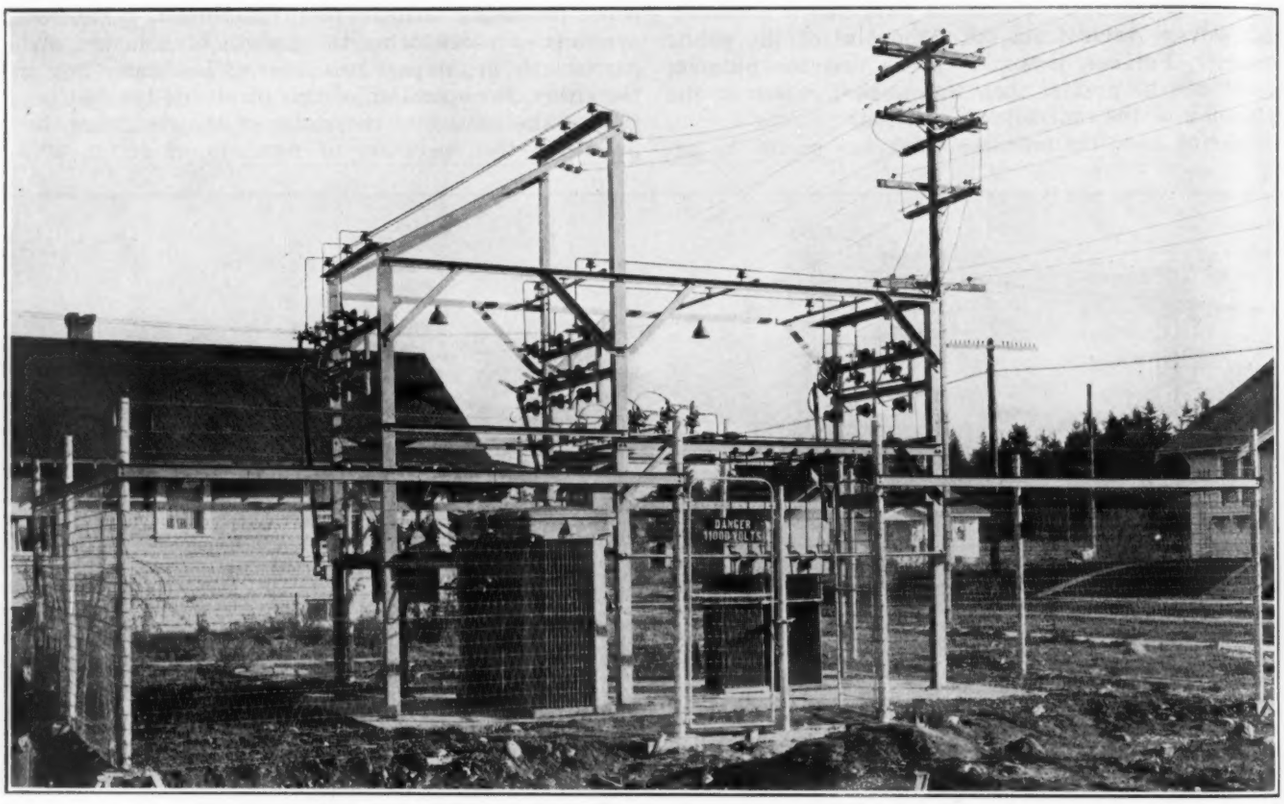
At the site of the nitrate plant at Sheffield, and entirely independent of the Gorgas plant, the government built a steam plant of approximately twice the size of the Gorgas plant. This plant was never used and would have been idle now had not the power companies leased it from the government and distributed its power over their systems.

The wide distribution of power from these plants to industries throughout the Southeast is to the writer a most convincing argument that the power to be created at Muscle Shoals dam should be made available for distribution to industries in the whole Southeast rather than be kept for local use in the vicinity of Sheffield.

Outdoor Substation for 2,400 Volts

Including Real Estate, the Type of Outdoor Substation for City Distribution Adopted in Portland, Ore., Cost About $8,500 Each—Construction Features Shown and Design Details

By E. D. SEARING
Construction Engineer Portland (Ore.) Railway, Light & Power Company



OUTDOOR SUBSTATIONS OF THIS TYPE ARE USED IN RESIDENTIAL DISTRICTS OF PORTLAND, ORE., TO SUPPLY 2,400-VOLT DISTRIBUTION

MANY changes in the distribution systems of power companies to relieve the overloaded conditions of lighting and power feeders have become necessary as a result of the increase in load due to the building activity and the general business revival throughout the country. Some companies are going to 4,000-volt, four-wire, star-connected systems, while others are changing over single-phase, 2,400-volt feeders to three-phase, or increasing the size of copper in existing three-phase circuits.

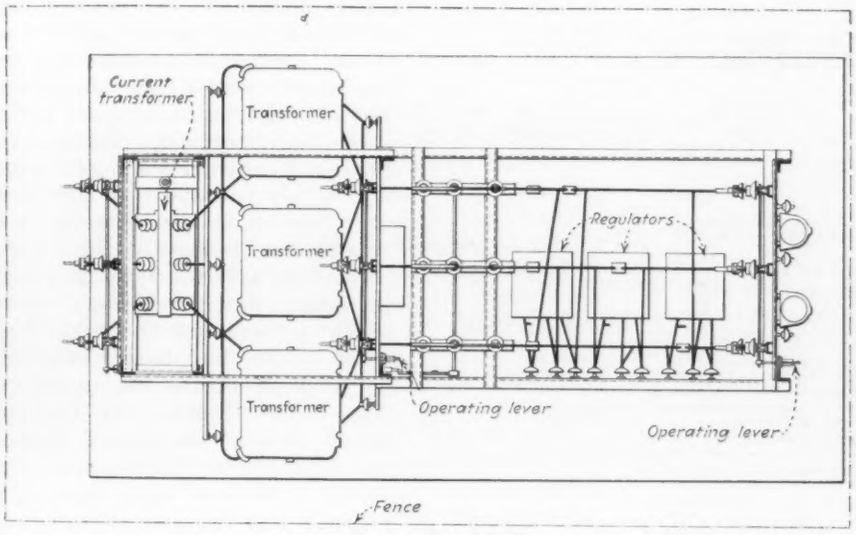
The practice of the Portland (Ore.) Railway, Light & Power Company in the past has been to supply all 2,400-volt city distribution circuits from substations having one or more personal attendants. The installation of feeders from such substations usually consisted of two wires forming a single-phase circuit. As the load grew a third wire would be run, making the circuit three-phase, thereby insuring a greater capacity and more efficient utilization of the copper. Following the period of winter load in 1920-1921, it became apparent that some means of supplementing the existing distribution circuits was necessary. The greater use of electricity per customer and a large increase in the number of customers established the fact that either more feeders would have to be run from existing stations or that other provisions must be made to handle the growing load. The existing substations, besides being located considerable distances from the centers of load, were in most cases found already congested with equipment and outgoing feeder circuits.

From an economic study it was seen that outdoor substations located near the center of load were preferable, and as a result this solution of the problem was adopted. Consideration from the standpoint of reliability of service and accessibility for inspection and repair led to the adoption of a ground location for the equipment in preference to the pole-type structure sometimes employed. A study of the districts being served was made and new centers of load located. A canvass of vacant lots in the vicinity of these distribution points was made, and suitable property on which to locate the outdoor substations was purchased.

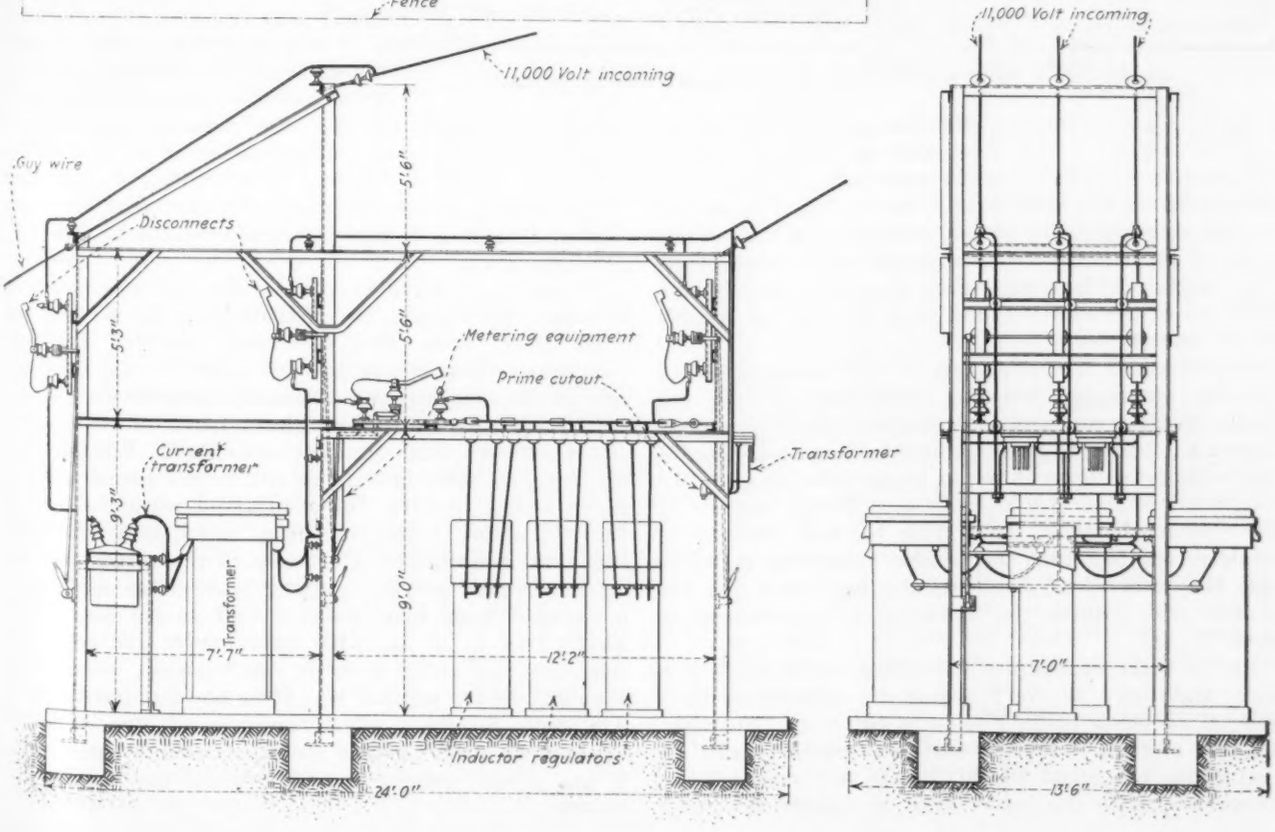
The type of substation decided upon called for step-down from 11,000 volts to 2,400 volts. Connection to each substation was made from existing 11,000-volt tie lines between substations having attendants, and

new lines were run where no 11,000-volt lines already existed. The company's low-tension transmission system consists of 11,000-volt tie lines between various substations having attendants. Usually each substation is fed from two or more adjacent substations by 11,000-volt tie lines and occasionally from the 57,000-volt transmission lines as well. It will thus be seen that the system of 11,000-volt lines is somewhat analogous to a spider-web network. This arrangement insures that each substation is normally fed from at least two sources. The 11,000-volt tie lines which feed the outdoor substations have pole-top sectionalizing disconnecting switches on either side of the connection to the substation, thereby making it possible to feed the outdoor station in case of line trouble from the substation on either end of the tie line.

The outdoor substations are each designed to contain three 200-kva., 11,000/2,400-volt, single-phase transformers, three 150-amp., 10 per cent buck-or-boost induction regulators and one 11,000-volt automatic oil circuit breaker. Control and auxiliary equipment consist of disconnecting switches between the oil circuit breaker and the line and between the 2,400-volt bus and feeder, also for shunting out the induction feeder regulators. Two 1½-kva., 2,400/120-240-volt transformers are provided for furnishing power to the regulator motors, lighting, and potential for a recording demand watt-hour meter. The meter, together with current transformers, is installed in a weatherproof metal box mounted on the structure. The initial installation generally includes only two transformers and two regulators, the third transformer and regulator being added as the growth of load necessitates. The transformers and regulators are mounted on a concrete slab on the ground, a structural-steel framework being erected to support the disconnecting switches, oil



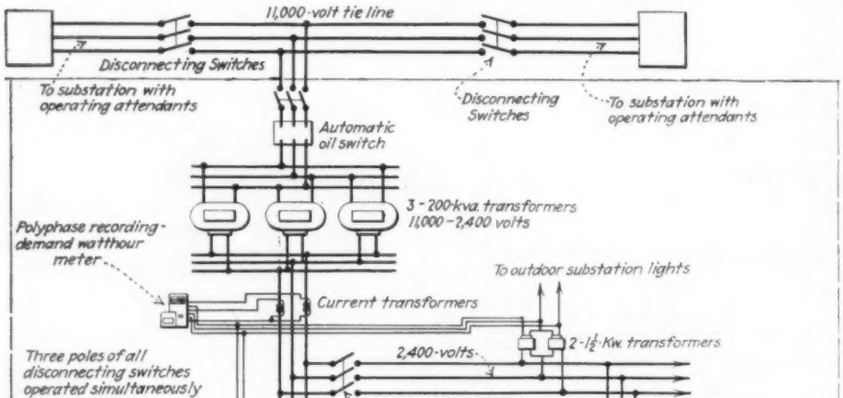
POLE TOP DISCONNECTS MAKE IT POSSIBLE TO FEED THE STATION FROM EITHER TIE LINE



circuit breaker and buses for the incoming and outgoing circuits.

The equipment is inclosed by a close-mesh, non-climbable type of woven wire fence surrounded with three barbed wires, the fence being supported on pipe supports set in concrete. Entrance to the inclosure is provided by a double swinging steel gate with a good padlock to insure protection.

The accompanying illustration shows one of the typical outdoor substations. There are five of these substations in operation at the present time, and plans are now under way for the construction of four more during the early part of 1923. The equipment and its arrangement in all substations are identical. A telephone mounted in a weatherproof metal box is installed within the fenced inclosure for use in case of substation trouble or in line patrolling. This telephone is connected with the company's railway and load-dispatching telephone systems. A number of lamps are provided on a circuit controlled by a switch for use at night should occasion require. The disconnecting switches are all arranged for simultaneous three-pole operation by handles placed on the structural framework and accessible from the ground. The output from each of the substations is ascertained from a recording demand watthour meter which is read each day. The hourly distribution of the load is found from the demand records of the same meter.



WIRING FOR OUTDOOR SUBSTATIONS, TRANSFORMERS AND TIE LINES

Consideration is being given to the addition of suitable automatic reclosing equipment to the oil circuit breaker as insurance against extensive service interruptions due to feeder trouble. In case of trouble the reclosing equipment would be designed to close the oil circuit breaker periodically a sufficient number of times either to allow the trouble to clear itself or to establish the fact that the trouble is serious, in which case the switch will automatically lock open and the trouble will require the attention of troublemen to clear it.

So far these substations have fully served their purpose, and there is every reason to recommend their general adoption under similar conditions. The average cost of each of the installations complete, including real estate, was about $8,500; this is very reasonable in comparison with the indoor type of substation.

Why to Use the Radio Telephone

BY H. L. WILLS
Georgia Railway & Power Company

THE development and operation of large electric power generating stations and widespread distributing systems would have been delayed and hampered had there been no means for keeping in close and almost instant communication with the activities of those engaged in the construction and operation of the more or less distant units.

During the time when electric service systems were distributed over relatively small areas and power stations were within easy reach of the local telephone lines, a ready means for inter-system communication was obtained through the service of the telephone companies. It soon developed, however, that valuable time was lost by inattention and mistakes of telephone operators, the chance of lines wanted being in use and similar difficulties. Moreover, group conferences were almost impossible. As an emergency measure private telephone lines were installed between the most important points, and as the power systems expanded these private telephone lines extended until in some cases a very real and very busy telephone system resulted and the once "private line" was lost in the system.

Then the call for some means of intercommunication between these private systems and the public telephone system had to be answered, and as a result the old troubles—"Line busy," "Number Six-two-eight doesn't answer," overworked or inattentive operators—flourish as of yore, the only difference being that a few minutes in the business of yesteryear was of less importance than a few minor fractions of a minute are now.

Today another means of communication is available for use—the radio telephone—and where the importance of communication service warrants, advantage should be taken of it, not with the idea that it is a cure-all or an infallible agent, but with the conviction that it is a valuable reinforcement to lines of communication.

It has been urged that the radio telephone is not reliable. How about the reliability of the wire lines when wind, flood, fire, power-line troubles and the troubles of the telephone line and apparatus cut off communication, leaving one absolutely helpless so far as connection with the remote power house or with some important switching center is concerned? What would one not give sometimes to be able to put across a half-dozen sharp, incisive, full-of-meaning words and hear the "All right, I get you, boss," come back assuring him that co-ordinated effort toward the restoration of an interrupted service is under way? Has not many a central-station man added a year to his age in an hour's time as he sat with tense nerves and toyed in impotent rage with a worse than useless telephone? Wouldn't he try another way if he had an opportunity? The radio telephone offers this opportunity. With it one almost always gets a message through some way. It has already proved to be a faithful tool to have in reserve.

New Sequence System of Polyphase Meters

A Proposed Method of Meters and Metering for the General Case of Polyphase Circuits Based on Sequence Analyses—Simplicity and Accuracy Are the Keynotes of the Plan

By R. D. EVANS

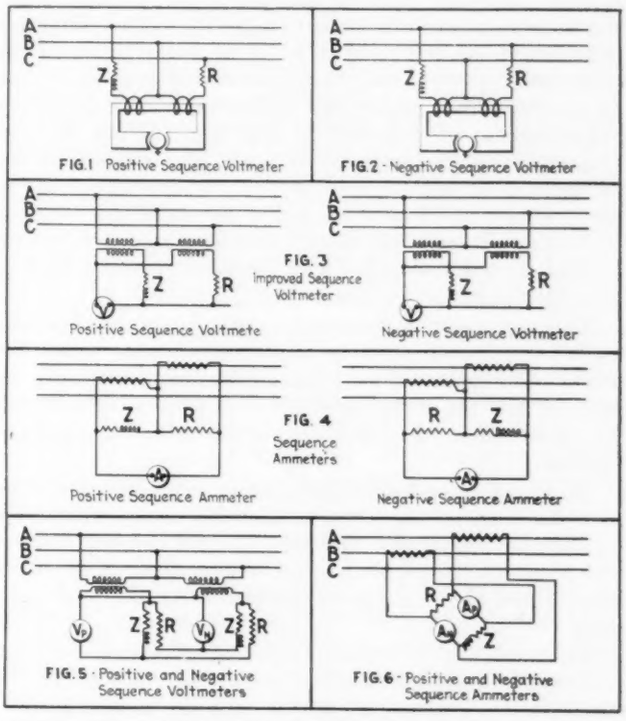
General Engineer Westinghouse Electric & Manufacturing Company

A NEW system of measuring devices for polyphase circuits has been proposed. The new measuring devices form a complete system for polyphase circuits and include voltmeters, ammeters, wattmeters, reactive wattmeters, power-factor meters, unbalance meters and also relays. The advantages of the proposed system in comparison with the systems in use at present may be stated as (1) simpler and more direct indications of circuit conditions, and (2) the requirements of fewer metering elements to indicate circuit conditions.

The present systems of measuring devices for polyphase circuits in general indicate phase quantities, as voltages or currents, or summate the phase quantities, as in the case of the polyphase wattmeter. In the development of these systems for polyphase circuits consideration was given principally to the "particular case," i.e., the balanced circuit. The "general" case of the polyphase circuit—i.e., the unbalanced circuit—was not well understood as evidenced by the discussion as to the definition of "polyphase power factor."

A method for analyzing unbalanced polyphase circuit conditions was presented by C. L. Fortescue in his paper on "Symmetrical Co-ordinates." This method is based on the fact that any unbalanced polyphase system may be resolved into two or more balanced or symmetrical systems. For example, in a three-phase, three-wire circuit an unbalanced system of currents may be resolved into two symmetrical three-phase systems in which the currents of one system reach their maxima in the different phases in a positive sequence, as *A*, *B*, *C*, and the currents of the other system reach their maxima in the negative sequence, *C*, *B*, *A*. The method used here of resolving currents into components, positive and negative sequence, is similar to the method now in general use for resolving currents into components in phase, or active, and out-of-phase, or reactive. The reasons for the resolution of the currents into components for the two cases are the same, namely, that the different components have different effects, thus simplifying the solution of the problem. One advantage of this method resides in the fact that it is possible to deal with a few symmetrical systems—two for the three-phase, three-wire system—in varying proportions instead of dealing with an infinite number of combinations of unbalanced systems. Two results this investigation has produced are (1) a revision in the conceptions of polyphase circuit measurements, and (2) recognition of the desirability of a new system of measuring devices which is simpler and more accurate for the general application.

The new measuring devices are based on the resolution of the different quantities of the "general" polyphase circuit into the different phase-sequence components. Each of these phase-sequence components, if present on a polyphase circuit, may be measured. The method of separating these components is accomplished by the devices which will be described in the latter part of this article.



METERS USING THE SEQUENCE PRINCIPLE AFFORD SIMPLICITY IN CONNECTIONS, ACCURACY IN METERING AND RELIABLE RELAYS FOR PROTECTIVE PURPOSES

The following explanations of the phase-sequence devices will, for the sake of brevity and clearness, be based on their application to the three-phase, three-wire circuit. For these circuits, the relations between the different voltages may be expressed as follows:

$$E_A = E_P + E_N, \quad (1)$$

$$E_B = a^2 E_P + a E_N,^* \quad (2)$$

$$E_C = a E_P + a^2 E_N, \quad (3)$$

where E_A, E_B and E_C are the line voltages and E_P and E_N are the positive and negative sequence components of voltages respectively. The solutions of these equations for positive and negative sequence voltages are:

$$E_P = \frac{E_A - aE_C}{1 - a^3} \quad (4)$$

$$E_N = \frac{E_A - aE_B}{1 - a^3} \quad (5)$$

These equations show how the voltage of one sequence component may be obtained from the voltages measured in the usual way.

The next step is to show that the separation of the

*a is an operator similar to j. a is equal to $(-\frac{1}{2} + j\sqrt{3}/2)$ and effects a rotation of 120 deg.; a^2, a rotation of 240 deg.; a^3, 360 deg.; or $a^3 = 1$.

different phase-sequence voltages, accomplished mathematically as shown above, can be accomplished by measuring instruments. Considering the positive sequence voltage, equation (4), all that is necessary is a meter with one winding taking a current in phase and proportional to the voltage E_A, and another winding taking a current proportional to the voltage E_C, but with a phase relation of $-a$. Such a meter is shown in Fig. 1. The external impedances, Z and R, are of such high value as to determine the magnitude and phase relation of the currents going through the windings. R is a resistance, and the current going through winding 1 is in phase with the voltage E_A. The next step is to determine the value of Z. The power factor of the impedance must be such that the current is proportional to $-aE_C$. As a represents a rotation of 120 deg., $-a$ represents —60 deg., or 60 deg. lag. Hence the impedance must be such as to cause the current in the winding 2 to lag 60 deg. behind the voltage E_C. To meet this requirement Z must be equal to $(0.5 + j0.866)R$. Hence this meter measures a quantity proportional to $E_A - aE_C$, and therefore proportional to E_P, the positive sequence voltage.

This same conclusion can be obtained in another way by showing that positive sequence voltages cause the meter to register, but negative sequence voltages do not. Hence the meter operates on a system with unbalanced voltages to indicate only the positive sequence voltage.

Negative sequence voltage may be measured in a similar way and by the same meter, only a change in connection is required. The diagram of connections for the meter to measure the sequence voltage is shown in Fig. 2 and the explanation follows directly from equation (5).

This method of measuring the different sequence voltages is generally applicable and may be extended to a different number of phases and to measure other sequence voltages. Another form of the positive and negative sequence voltmeters is shown in Fig. 3. This form appears to be the best for commercial use, as standard meter elements and standard potential transformers are employed.

PHASE-SEQUENCE AMMETERS

The different sequence currents may be measured in a manner similar to that of the different sequence voltages. Fig. 4 shows devices for measuring positive and negative sequence currents. The devices shown in Fig. 3 and 4† may be explained in the manner indicated above, or they may be explained from a different viewpoint, that of a network in connection with a standard meter element. This method of viewing the problem is very simple and gives a solution in convenient terms. From this viewpoint a voltmeter or an ammeter consists merely of a meter element which measures voltage or current, depending upon the network which connects it to the circuit. Hence to measure positive sequence current it is only necessary to obtain a network that permits only current of positive sequence to flow in the branch in which the meter element is connected. Such a network is shown in Fig. 4.

It is possible to combine the networks for positive and negative sequence-measuring devices so that separate transformers for each device are not required. Such a combination for measuring positive and negative sequence voltage is shown in Fig. 5, and a corresponding positive and negative sequence-current device‡ is shown in Fig. 6.

SEQUENCE WATTMETERS, REACTIVE WATTMETERS, POWER-FACTOR METERS, ETC.

Having separated out the positive and negative sequence voltages and currents, it becomes evident that it is possible to combine them to measure power, reactive power, and power factor. Standard instruments supplied with positive-sequence voltage and current measure positive-sequence watts, positive-sequence reactive watts and positive-sequence power factor.

A study of the preceding diagrams and explanations will show that there are certain devices now in operation whose success depends upon separating out more or less effectively the different phase-sequence components of voltages or currents. Such devices include those for indicating phase rotation and the ground-current relay operated from three-current transformers on the three-phase grounded neutral circuit. Instead of a number of isolated devices, there is proposed a complete system of devices, all utilizing the same principle.

The phase-sequence-measuring devices are relatively simple, involving standard meter or relay elements with standard types of potential and current transformers and auxiliary networks consisting of resistors and reactors. With the phase-sequence method fewer metering elements are required to indicate circuit conditions. For example, one positive and one negative sequence ammeter will replace three single-phase ammeters. In addition, the phase sequence devices indicate circuit conditions to better advantage. An example in point is the application of the negative-sequence current device as a relay to provide protection against single-phase operation of motors. Some of the advantages of the sequence method of making polyphase power measurements are pointed out in a paper by C. L. Fortescue, entitled "Polyphase Power Measurements," to be presented at the 1923 midwinter convention of the American Institute of Electrical Engineers. In considering the application of the proposed system of measuring devices, there are two cases to be considered: First, one with no unbalance present, in which case the two systems give the same result and the proposed system has the advantage of employing fewer meter elements than are employed at present; second, one with unbalance present, in which case the two systems will give different results and it will probably be desirable to give consideration to unbalance, which is best measured by the system proposed.

†This unproved form is due to C. T. Allcutt.

‡This device was suggested by C. L. Fortescue.

Permissible Electric Drills

THE Bureau of Mines has issued a report embodying the results of an investigation into the matter of permissible electric drills, "permissible" referring to use in gaseous or dust-laden mine atmospheres. The report (Serial 2,434) has been compiled by H. B. Brunot and H. B. Freeman. Two makes of electric drills have successfully met the requirements of the bureau. The formal approval of these drills means that if they were inadvertently operated while immediately surrounded by an explosive mixture of gas as the result of accidental interference with the ventilation, the atmosphere surrounding the drill would not be ignited even though an explosion took place within the equipment.

Aspects of the Central-Station Sales Effort*

Necessity of High-Type Service—Customer's Position Reversed in Merchandising Department, Where He Is No Longer a Supplicant

DURING the past few months the sales departments of the central-station industry have furnished a topic for many discussions. It seems to be generally believed that these departments should be more seriously considered, receive more attention and in many instances have the scope of their activities greatly broadened. If the men in such departments have not developed as rapidly as might be desired or the departments been as helpful as they should, the fault may not be entirely their own. In the stress of other problems sales departments have too often been permitted to drift of their own momentum and have not been used to the extent which might have been the case with proper organization training.

In some companies of our industry, even today, the sales department is organized merely to merchandise goods; in other cases it takes on some additional responsibilities for soliciting small-power business; but in few instances does such a department really function in a broad way as a bureau of general business development and as a service department. Only in recent years has more been expected of a sales manager than to be the efficient head of a group of solicitors; but even though this be considered the sole purpose of such an organization, it is not certain that the industry has always reaped the full benefit of it.

Quality Service Essential

The real mission of the sales department is to sell more electricity by both direct and indirect methods, and merchandising for profit cannot be considered as more than incidental. Probably for several years to come the long-debated question of whether a central station should deal in merchandise at all will continue to be a perennial cause for difference of opinion. It would seem that the answer may be found by considering another question, namely, "By selling merchandise can we render a needful or a desirable service to our customers which they cannot otherwise obtain?" If local dealers and contractors offer but an inadequate service, then most assuredly the central station should fill the gap, even though the transactions themselves may not net a direct and traceable profit.

If the dealer and contractor does this work as well or better than the central station, there does not appear to be much justification for it to remain in a business for which it is not organized and for which it is not preeminently equipped. However, even in the latter case it is sometimes urged that central-station merchandising has a very salutary effect upon the methods and practices of other agencies engaged in the distribution of electrical goods.

Giving the Customer the Advantage

Another view of central-station selling asserts that in all other departments of utility companies the customer's relations are more or less those of a supplicant for service, which is granted him under certain conditions of the central station's making, while the floor of the sales department is a place wherein these relations are reversed. Here the company is actually soliciting favors from its customers, and it is believed by some that to have at least one department which of necessity must have contact with the public from a somewhat different angle is valuable and not to be lightly eliminated.

It is at least generally conceded that the public utility does not desire a monopoly of the merchandising business, that the activities of dealers and contractors all redound to the direct and immediate benefit of the central station, and that the latter should encourage and stimulate the contractor and dealer as far as possible, always having in mind that the central station's most profitable obligation is its customer. Utilities have not always been patient and helpful in their dealings with these outside local agencies. Some sales managers have been trained to expect the value of their services to be measured by the volume of their sales, and all such very naturally look upon the dealer as a rival instead of as an ally. This appears to be a somewhat narrow viewpoint which should be found easy to correct.

Are Our Goods Well Sold?

Those who are responsible for companies having established merchandising departments may well ask themselves: "Are our goods well sold?" Speaking very generally, the answer is "No," or at least not so well sold as they will be when volume ceases to be the goal of sales effort. There is room for much improvement in this respect. Stating the problem in other words, it would be: "Do our salesmen make people buy their goods rather than make them *want* to buy them?" and therein lies an important distinction.

Customers' closets and shelves contain many devices which they bought but did not want, and so they are out of use, producing neither revenue for the utility nor satisfaction for the owner. Some test inspections have shown as high as 25 per cent of owned devices out of use, largely because the keen desire for the service which the appliance could render was not sold with the device itself. In most instances, probably, this desire could have been implanted.

Doubtless more than 50 per cent of the electrical devices in customers' homes are not used to anywhere near their possibilities. Sweeping a floor is only one of many uses to which a suction cleaner may be put; percolators will do more than make coffee; flatirons are capable of far more service than merely smoothing out damp cloth, and yet a discussion with a selected group of owners of such devices proves that they know little or nothing of their possibilities. It must be assumed that the salesman did not know them either, or that he was merely marketing an energy-consuming device and considered it no part of his duty to sell a service, his mission having ended with the making out of his sales slip.

In our calculations of the possibilities of load building we should not overlook the one of better selling. The dealer is interested in selling those devices yielding him the greatest profit. It chances that nearly all such are the most insignificant consumers of electricity, while, on the other hand, devices which are the best load builders cost so little in the first place that the retailer cannot give more than casual service. If we find upon investigation that those devices which have been poorly

*From an address by H. T. Edgar, division manager Stone & Webster, Inc., Boston, before managers of utilities under the company's administration.

sold have been marketed by the dealer, we can at least consider the desirability of reselling them through advertising, service calls, etc. In any event our own sales departments must become something more than order takers and record writers if they are in any measure to justify their existence. It appears to be rather inconsistent with good business judgment to place so vital a factor as business development in the hands of the type of man who may be attracted by an inadequate salary and whose sole qualifications are those of a clever peddler.

THE PUBLIC RELATIONS OPPORTUNITY

Like the head of any operating department, the chief of the sales department should be a man capable of contributing real strength to the manager's staff. He should be familiar with the larger problems of public utility operation if he is to bring to his job that broad vision and understanding which now appear essential to successful operation. His position demands that he and his assistants maintain close contact with the public. It would seem to be desirable to select and train our sales managers to represent adequately their companies in that capacity. If they are to be bigger men, they will as a matter of course command larger salaries, but no public utility has yet conclusively determined the limiting value which can be placed upon the services of the right sort of man in this position, assuming that the latter means selling the company and its service to its customers rather than merely selling them energy-consuming devices.

Serious effort to train sales managers in many cases implies supporting them by furnishing better personnel in their departments. It has been too often assumed in the industry that if a given candidate for employment has no training, little education and appears good for nothing else, he should enter the sales organization. More careful selection of this sort of material could be exercised. It cannot be seriously maintained that our sales departments are today in general what we would like to have them. A reasonable length of time, if accompanied by genuine effort, will make them more profitable and helpful adjuncts of the utilities and a constructive force in the community.

Having raised the standard of requirement and performance in our sales departments, we shall have therein organizations specially trained in an understanding of the consumer and his desires, his dissatisfactions and state of mind—certainly a factor of great potentiality in accomplishing our desire for improved public relations. That such departments are not generally used for things which they presumably can best do is simply another way of stating that they are susceptible to substantial improvement, without depreciating the excellent work which they have accomplished in their previous development.

Ontario May Start Peat Manufacture

THE solution of the fuel problem of the Province of Ontario through the erection of a government-owned peat plant is made in a report of a committee of the Provincial Legislature. The committee, which has completed researches occupying seven years, expresses itself as strongly of the opinion that the manufacture of fuel from Ontario's peat beds is a commercial possibility and should be considered.

Electric-Steam Boilers in Western Sweden

THE use and employment of electricity for the generation of steam has been the subject of close study in Sweden for many years and has, United States Consul W. H. Sholes reports, to a certain extent been successfully realized in western Sweden, notably at Gothenburg and Vargon, especially during and immediately after the world war, when coal could be obtained only in insufficient quantities or at exorbitant prices.

The problem is chiefly of an economical character and of interest to countries either devoid of coal or endeavoring to eliminate it from their import budgets. The purely technical problems do not cause any difficulties; in fact, electric boilers, according to Swedish engineers, have proved to be simpler in construction, easier to build and erect than ordinary steam boilers, because fireplaces, smoke channels, smokestacks and fuel storage are unnecessary. Loss of heat by the smoke and gases escaping through the smokestack is avoided, it is claimed, and the loss of heat on account of radiation from an electric steam boiler can be reduced to such an extent that the working efficiency of the boiler can be brought up to 98 per cent, even if no more than 96 per cent can be counted upon in normal operation. Steam with working pressure can be raised within ten to twenty minutes.

Engineers in Sweden calculate that with a normal effect of 96 per cent about 825 caloric units are obtained per kilowatt-hour. The amount of heat required for generating 1 kg. of steam depends, however, on the temperature of the feed water as well as on the heat of the steam generated and the pressure to which it is subjected. Besides this, the price of coal as compared with the price of electrical energy must be taken into consideration, also continuous or interrupted use of electric power, the use of "surplus" electric power at night and on holidays and similar factors.

Local experience is that in electric generation of steam 1 kw-hr. can supplant 0.18 kg. of coal of average quality, and that therefore, with a coal price of 15 kronen ($4.02 at par) per ton, which was not unusual before the war, the cost of fuel for generating 1,000 kg. of steam will be 2.14 kronen ($0.574 at par). In order that the cost for the electrical energy per 1,000 kg. of steam generated in an electric boiler shall in this case be the same as the cost of fuel for the same amount of steam generated in an ordinary boiler, the price of energy must not exceed 0.27 öre (0.07236 cent) per kilowatt-hour. In Gothenburg the price is 15 öre. However, if the price of coal be 200 kronen ($53.60) per ton, which it was occasionally during the war, the equivalent price of electrical energy would be about 3.6 öre, and the cost of fuel or of the electrical energy would be 28.57 kronen ($7.66) per 1,000 kg. of steam.

For purpose of comparison, it may be mentioned, however, that the present price of coal in quantities is about 50 kronen ($8.04) per ton, and that the lowest ordinary price of second-hand converted electric power in the city of Gothenburg is 15 öre (4.02 cents) per kilowatt-hour. Therefore it is evident that first-hand alternating current direct from hydro-electric power stations can come into consideration only for the purpose under discussion.

Electrical energy in western Sweden is in many cases sold per kilowatt-year. In such cases the price of the electrical energy per kilowatt-hour is in an indirect proportion to the effective time of operation per annum.

Letters from Our Readers

A Place Set Apart for Suggestions, Comments and Criticisms, to Which All Men of the Electrical Industry Are Cordially Invited to Contribute

Cost of Selling Appliances

To the Editors of the ELECTRICAL WORLD:

Some two or three years ago the Electrical Contractors' Association sent out a questionnaire to its members and compiled some statistics which showed that the cost of handling electrical appliances amounted to about 35 per cent of the selling price. Inasmuch as several commodities, particularly washing machines, vacuum cleaners and ranges, which ran into a large figure did not carry on an average more than 25 per cent to a dealer, it was evident that there was no money in handling appliances from the contractor-dealer's standpoint.

The jobbers have also investigated this matter, but as jobbing experience is more or less varied between men who only receive and ship out in original packages and those who retail, I have no record of any definite figures being determined. I was at the contractors' meeting in Cincinnati where Mr. Gilchrist brought out the fact that central stations' contractor-dealers must get more of a "spread."

From our experience in appliances we know that the central station or the dealer that retails units such as washing machines, vacuum cleaners, ranges, refrigerating outfits and appliances of that type has a large expense bill in connection with demonstrating, trucking back and forth and then servicing the apparatus after it has been installed. We believe it is all right for central stations to exploit machines which require demonstration and a large amount of service, even though this may not show a profit, since the demand must be created and the experimental "try-out" with the public must be conducted by somebody and central stations are naturally better equipped financially to do this experimental work. But after the appliance has reached the condition that the vacuum cleaner, washing machine and range have reached today it should not be necessary to sell these goods at a loss, but the public will then be well enough acquainted with them to make the expense of exploitation unnecessary.

This is illustrated in the case of the flatiron. When the flatiron was first brought out it was necessary to allow a customer to try it out and experiment with it, which added to the selling cost. In fact, in the early years of the flatiron it was sold at a loss. Today the flatiron is recognized as a household commodity, and there should be no expense in connection with demonstrating or exploiting it. We believe, from our experience, that selling appliances such as flatirons, toasters, percolators, etc., can be handled at a smaller margin of profit than in the case of other types of machines.

I have looked into this situation from the department store's and furniture store's standpoint. I find as a general thing that department stores and furniture stores are not interested in handling large electrical appliances unless there is a spread of 50 per cent or more. I understand the usual spread in furniture is even higher than this. It would seem to me the only thing for us to do is to let the jobber, the central station and the contractor-dealer on the one hand get together and determine what is an equitable profit for handling these goods and then present this proposition to the manufacturer.

JOHN P. COGHLIN.

Worcester, Mass.

Does Not Consider Absolute Elimination of Ionization Essential

To the Editors of the ELECTRICAL WORLD:

I have read with interest D. W. Roper's article on "Recent and Prospective Developments of Underground Cable." I agree with his statements with one exception —I do not feel sure that it is necessary to eliminate air ionization entirely as specified in the third paragraph from the end of his article. I know of a number of cables which have been in satisfactory service for several years in which ionization of occluded air undoubtedly occurs at operating voltages and has not been harmful in any way.

Mr. Roper is quite right in placing so much importance upon inspection at the factory. It will only be by very thorough control that it will be possible to obtain cables for voltages of 110,000. However, it is not only at the cable factories that this control is needed, but also at the factories of the paper makers and oil refiners.

WILLIAM A. DEL MAR,
Chief Engineer.

Habirshaw Electric Cable Company, Inc., Yonkers, N. Y.

Ungrounded Lighting Fixtures Condemned as Unsafe

To the Editors of the ELECTRICAL WORLD:

I wish to register approval of the suggestion made by Fred Clayton in your issue of Dec. 20 last regarding the fusing of a grounded neutral. His idea of placing two fuses in series on a hot wire is very good in overcoming the objection that protection of only one fuse will be provided if the grounded wire is run continuously. There are serious doubts in my mind, however, whether this objection is justified considering the benefits derived from continuously wired ground. My personal opinion is that the use of one fuse to protect a circuit meets with objection simply because it is not the way we are accustomed to doing things. In other words, the use of one fuse to protect a circuit must overcome the inertia of the old methods with their historical backgrounds.

Along this same line, the writer cannot understand why agitation has not been brought to bear in the past against the use of ungrounded electric lighting fixtures. While death from lighting voltages occurs rarely, nevertheless a few instances are known to the writer where death would have been prevented had the fixtures been grounded as is done in the case of motor frames. This, perhaps, would create a little additional fire hazard, but I think it is high time that the value of human life as well as the value of property should be considered.

It is the writer's personal opinion that the frame of every electrical device, whether it be motor, transformer, electric light fixture or what, should be securely grounded and that the neutral of lighting circuits should be grounded and run continuously without fuse from transformer to end of circuit. This practice would result in uniformly safe installation.

EARL E. NORMAN,
Superintendent.

Department of Public Utilities, Kalamazoo, Mich.

Central Station and Industrial Practice

Installation, Operation, Maintenance, Test and Repair of
Generation and Distribution Equipment, and Methods of Economically Utilizing
Electric Service in Large Industrial Plants

Testing Relays Prior to Installation

Checking Correctness of Operation Before Placing Apparatus in Service—An Account of Particular Interest to Small Companies Unfamiliar with This Work

THE relays which are provided throughout an electrical generating and distribution system are far more important than would appear on first thought as the continuity of service of a part of a system or even an entire system depends upon the correct functioning of such relays. Too much stress, therefore, cannot be laid upon the care which should be used, first, in selecting the proper types of relays; second, in inspecting and checking them at the time of placing them in service, and, third, in maintaining a rigorous routine inspection and calibration. The failure of relays to isolate a piece of equipment at the time of the occurrence of a fault may lead to serious damage which would not be caused if the equipment were removed from the system instantly.

It is intended in the following discussion to cover the most important points that should be taken care of in the inspection of relays when they are received prior to placing them in service, but not to touch on those comparative tests which should be made on a number of relays at the time a choice is made of the particular type to be used.

All relays when received should be inspected very carefully to make sure that there is no foreign material in them and that no breakage has occurred since leaving the factory. All moving parts, such as plungers, disks, etc., should be examined to make sure that they move freely throughout the entire range. It is also important to see that all contacts close and open properly and that no parts have worked loose.

Potential tests (about 1,000 volts) should be made on the windings and contact systems of the various relays to make sure of good insulation and clearance. Typical connections for this test are shown in Fig. 1.

Most excess-current relays have time adjustments and should be checked for operating current and time at several points, one of which should be the minimum operating current and another a current large enough to cause the relay to operate on the flat part of its characteristic curve. A cycle counter will be most convenient to measure the time, and the general scheme of connections can be as given in Fig. 2. Usually there are characteristic curves furnished with the relays which should be compared with these test data and used later for setting the relays when installed.

Power directional relays, in addition to being inspected as outlined above, should be connected to a test circuit in the laboratory to make sure that the leads are brought out properly so that the tripping contact will close on the proper direction of energy transfer. Fig. 3 shows the connections for making this check on Westinghouse type CR relays. The General Electric type IK relay can be tested in the same manner with slightly different connections. The adjustment of the power directional relay must be very carefully made as in case of line failure the voltage is much reduced and with this low voltage on the potential coil comparatively little torque is pro-

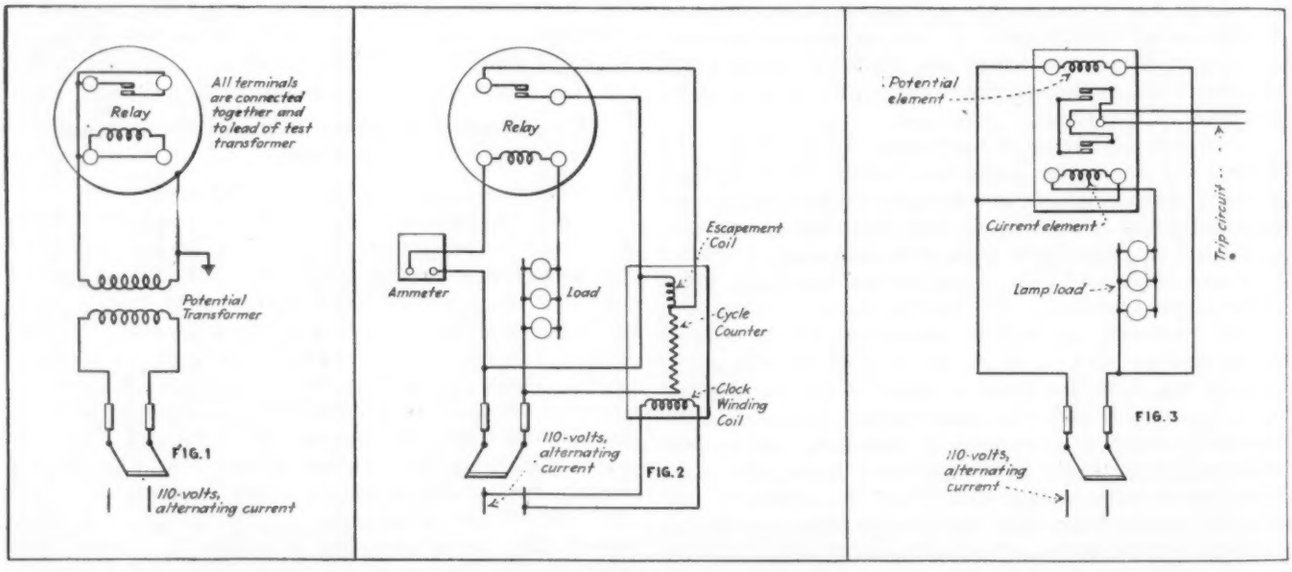


FIG. 1—TESTING INSULATION OF RELAY WINDINGS AND CONTACT SYSTEM. FIG. 2—CONNECTIONS FOR TESTING EXCESS-CURRENT TIME-LIMIT RELAYS. FIG. 3—TRIPPING CONTACTS SHOULD CLOSE WHEN TESTING WESTINGHOUSE TYPE CR REVERSE POWER RELAYS USING THESE CONNECTIONS

duced. If not carefully adjusted, it is possible under the condition of low voltage that the operation of the directional relay may require more time than with the excess-current relay which is properly set in conjunction with other relays on the system and thus destroy selective action. The excess-current relay used with power directional relays may or may not be in the same case with them, but in any event should be tested as outlined above.

Single-winding differential relays are to all intents and purposes instantaneous excess-current relays and should be inspected carefully and checked for operating current.

In later issues comments will be given on the checking of relay installations prior to placing them in service and on routine testing and calibration of relays.

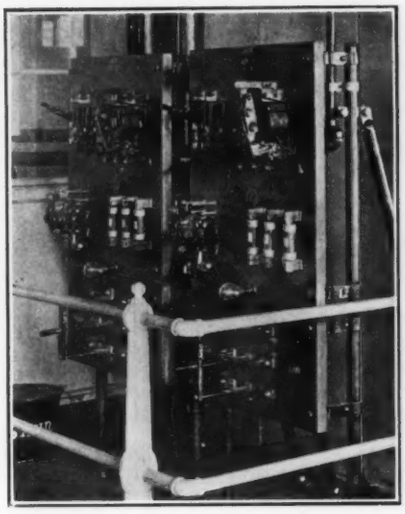
RAYMOND BAILEY,
Assistant Chief Electrical Designer.
Philadelphia Electric Company,
Philadelphia, Pa.

Electric Japanning Ovens for Optical Company

TWO batteries of electrically heated japanning ovens are now operating in the Bausch & Lomb Optical Company's factory at Rochester, N. Y., and the company's experience with them is interesting both because of the character of the work done and the results obtained. The material baked comprises not only high-grade japan, but rubber enamels and bakelite, and the finished parts are used in the assembly of microscopes, field glasses and other instruments where the quality of the finish is of paramount importance. The effect of electric heat on the quality of the finished articles and upon the over-all production cost, under these exacting conditions, should be of interest to those with similar problems to overcome. Since the ovens have been installed the percentage of parts rejected because of improper baking has been reduced to about 4 per cent of the total amount baked, as compared with about 50 per cent with the gas ovens formerly used for the same purpose.

The total installation of ovens comprises two truck-type and three shelf-type units, both types having a connected load of 36 kw. each in heaters, or a total of 180 kw. at 230 volts, three-phase, 60 cycles.

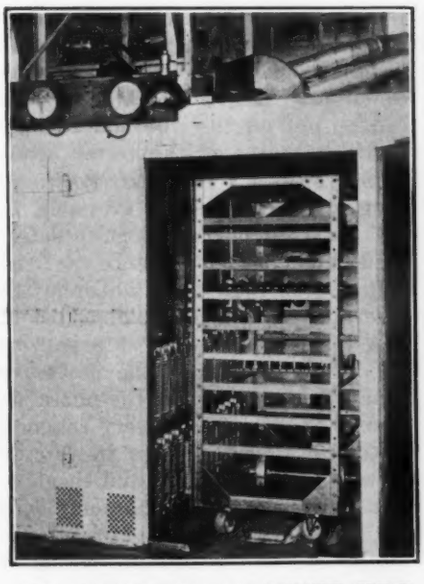
The two box-type ovens are installed in one end of a small room, the rest of which contains the spray



CONTROL APPARATUS FOR ELECTRIC OVENS

hoods, trucks, etc. Each oven is 5 ft. wide by 6 ft. 6 in. deep by 6 ft. 9 in. high. They are of the box type built by Young Brothers of Detroit. The heaters are installed in two banks, on each side of the ovens, extending from front to back, about half way up the walls. The control is automatic. The two automatic control panels, furnished by the General Electric Company, are installed together at one end of the ovens and carry the necessary contractors, pilot lights, overload relays and a double-pole, double-throw switch on each panel for changing the heater connections from Y to delta to obtain high or low heat. The temperature range is between 300 deg. F. and 450 deg. F.

The shelf type ovens are mounted along the side wall of another room,



FEWER REJECTIONS AND GREATER SPEED IN BAKING ARE ADVANTAGES OF ELECTRIC OVENS

which is also used as a spraying room. The baking space of these ovens are each 3 ft. 4 in. wide by 2 ft. 5 in. high by 3 ft. deep. The heaters are installed between the bottom of the lower baking compartment and the floor level of the room. These ovens are also automatically controlled. The automatic control panel for each oven is mounted directly above the oven itself, while the instruments are mounted on the rear of the ovens.

The most interesting feature of the installation, however, is the effect the ovens have had upon production as regards both economy and volume. The parts must have an exceptionally high quality of finish owing to the uses to which they are put. This may be elaborated by saying that these finishes must be duplicated time after time on a large number of different parts, as these are baked in large numbers and then returned to stock for assembly later. The effect of a number of parts with varying degrees of finish assembled together on the same microscope, for instance, need not be emphasized.

STRICT TEMPERATURE CONTROL IMPORTANT FACTOR

The ability to control the temperature of the ovens accurately makes this duplication of results possible, as the degree of finish is determined by the temperature of baking. Furthermore, the absence of contaminating gases in the oven interior is an important factor in decreasing spoilage.

This same freedom from contamination, which extends to the atmosphere surrounding the ovens, makes it possible to put the spraying machines in the same room, which naturally saves much time and labor in handling the material to be baked. Since articles can be baked much more rapidly owing to the higher temperatures possible with electric heat, the time of baking per load has been reduced from about five hours with gas ovens to about one and one-half hours with electric ovens, at temperatures of from 300 deg F. to 450 deg. F. according to the finish desired. To sum up the matter, the economy of the electric oven has been found to exceed that of the gas oven because of fewer rejections, greater speed in baking and the saving in space, labor and material that can be directly traced to its use.

E. H. FETZ,
Factory Engineer.
Bausch & Lomb Optical Company,
Rochester, N. Y.

COMBINATION OF BELT CONVEYOR AND BOX-CAR LOADER UTILIZED IN JAPANESE POWER PLANT TO HANDLE COAL

Coal-Conveying System in Japan

THE installation of an American-built belt conveyor and a box-car loader at the gas works in Kobe, Japan, proves that the efficiency of this method permits it to compete with the cheap labor obtainable in Japan. This plant operates with slack coal. The combination of a belt conveyor and a box-car loader, as illustrated, makes for very flexible operation in handling coal. The loader has been developed to deliver sand and other materials to the farthest corner of a box car without the machine itself taking up much room; but Japanese engineers have used this loader in conjunction with a standard belt conveyor so that still more efficient operation is obtained. This information was obtained from the Link-Belt Company, Chicago.

FIELD EDITOR ELECTRICAL WORLD.
Chicago, Ill.

Gravity Pipe Line Saves 150 Kw.-Hr. a Day

BY BUILDING a new condensing-water intake line from the Concord River to a cold well outside the local 1,200-kw. municipal lighting plant located at Concord, Mass., it was found that 150 kw.-hr. a day could be saved which had formerly been consumed in operating a motor-driven centrifugal pump. Formerly a 7.5-hp., 200-volt, two-phase vertical motor in a pump house near the river ran a pump which lifted the water about 8 ft. and delivered it to the plant through a 12-in. pipe 600 ft. long. The new line of 18-in. wooden staves enables gravity flow to be obtained from the river, the length of the line being about 620 ft. On account of quicksand and other poor foundation conditions, the cost of the new line with intake-screen connections, etc., was about $6,600, but at a conservative figure for the energy consumed by the pumping outfit, the investment will be retired in a reasonable time by the change, besides giving a more reliable service. The former pipe line and pumping outfit are held in reserve.

FIELD EDITOR ELECTRICAL WORLD.
Boston, Mass.

Reversal of Meter Torque at Low Power Factors

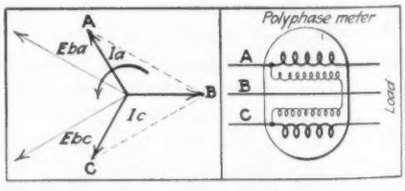
OCCASIONS often arise when it is desired to determine which element of a three-phase watt-hour meter is exerting a backward torque under conditions of lagging power factors below 50 per cent. This condition is easily ascertained if a small highly inductive load, such as a motor lightly loaded or running idle, can be put on the line and the potential circuits of the meter alternately opened. However, such opportunity is not always available, in which case it is convenient to determine the phase sequence at the meter, thus indicating which is the reversing element, as explained below.

A tester usually has as a part of his testing equipment the necessary apparatus to determine the phase sequence or rotation. A very common method is to connect two 25-watt or 40-watt, 110-volt lamps and the 110-volt primary of the phantom loading transformer or the 110-volt potential coil of the rotating standard in star connection to the three-phase line. Then if *A*, *B* and *C* represent the phase rotation, as shown in the accompanying illustration, line *A* should be the one connected to coil, line *B* the one connected to the dim lamp and line *C* the one connected to the bright lamp. A telephone condenser rated at 1 mfd. might be used in place of the coil and the order would be reversed.

If the upper element of a meter reverses at low lagging power factors, it is found that the lower element will be the reversing one if two of the line wires ahead of the meter are interchanged, causing the phase rotation to be reversed. It is thus apparent that there is a definite relation between phase rotation and the question of which of the elements will reverse in direction of torque exerted on the meter disk when the power factor of the load is lagging and below 50 per cent.

A study of the vector diagram will show that if phase rotation is indicated by *A*, *B* and *C*, the current coil of the reversing element will be in line *A*; the line *B* will be the one common to both potential coils, while the current coil of the element always running forward will be in line *C*.

Referring to the diagram and assuming a balanced load, vectors I_a and I_c represent the current in the two current coils in phase relation (under conditions of unity power factor) to the vectors E_{ba} and E_{bc}, representing the voltage across the potential coils of the upper and lower elements respectively. The vector rotating in the direction indicated by the arrow, it is evident that as the current lags behind the voltage, due to inductive condition of the load, the voltage vectors E_{ba} and



REVERSAL OF METER TORQUE ON INDUCTION MOTOR LOAD STUDIED BY USE OF VECTOR DIAGRAM

E_{bc} will advance ahead of their respective current vectors, I_a and I_c. Now, since the voltage vector E_{ba} of the upper element is already (at unity power factor) 30 deg. ahead of its current vector I_a, while the voltage vector E_{ba} of the lower element is, under the same condition, 30 deg. behind its current vector, it is shown that the voltage vector E_{ba} of the upper element will become 90 deg. ahead of its current vector first.

Any further separation of the voltage and current will cause reversed torque on the meter disk by the upper element.

FOSS C. HUSH,
Iowa Service Company, Meter Tester.
Red Oak, Iowa.

Standard Nomenclature for Oil Circuit Breakers

A NUMBER of definitions covering standard nomenclature for oil circuit breakers were adopted by the Electric Power Club at its regular fall meeting held at Asheville, N. C. These should greatly assist in furthering clarity in specifications. A partial list of the definitions is given below.

Accessories — To be used broadly to include both attachments and auxiliaries.

Attachments — Accessories to be attached to a circuit breaker as distinguished from auxiliaries.

Auxiliaries — Accessories to be used with circuit breakers but not attached to them, as distinguished from attachments.

Automatic Trip—Operation of a circuit-opening device due to changes in current or voltage or other electrical conditions without requiring manual control. Automatic operation may be obtained by the use of any one of the following devices: (a) Self-contained overload trip connected to current transformers with or without relays; (b) shunt trip energized through relays operated by current or potential transformers; (c) self-contained series trip directly connected in the circuit; (d) under-voltage trip with or without potential transformers.

Baffle (Deflector) — Device for deflecting oil or gas.

Barrier—Partition for insulation or isolation of electric circuits or arcs.

Bell Alarm Switch — A switch controlled by the automatic opening of a circuit breaker and designed to close the circuit to a bell or other audible signaling device.

Bell Crank — A rectangular lever by which the direction of motion is changed through an angle.

Bushing — The part insulating a through conductor.

Calibration — A set of graduations marked to indicate the values of current or voltage at which an automatic trip device can be set to operate.

Cell—A compartment to isolate circuit breakers or other switching equipment.

Cell Doors — Doors for closing the front or rear of a cell.

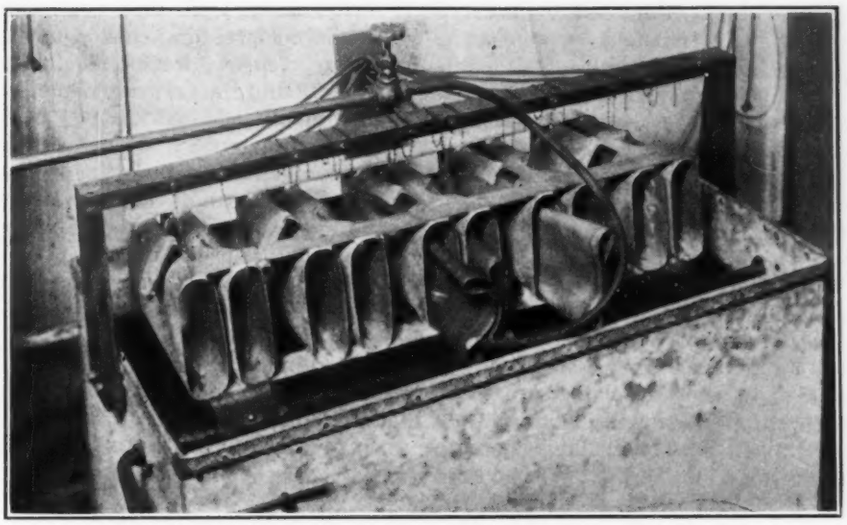
Cell Structure — A set of compartments to house switching equipment.

Clevis—A fitting having a U-shaped end and arranged for attaching to the end of a pipe or rod.

Fume Resisting — Fume-resisting switching and control apparatus is apparatus so constructed that it will not be readily injured by the specified fumes.

Pipe End (Rod End) — A fitting arranged to connect the end of a pipe or rod to a lever, bell crank or other part.

FIELD EDITOR ELECTRICAL WORLD.
New York, N. Y.



ROTATING ARM HOLDING GLOVES IN TESTING EQUIPMENT SAVES TIME

Time to Test Rubber Gloves Cut 60 per Cent

THE number of rubber gloves which must be tested regularly is often considerable, and labor-saving methods are very helpful in this work. During the first half of 1922 an average of more than 550 gloves a month was tested at the laboratory of the Edison Electric Illuminating Company of Boston, and the time per pair has been cut from about five minutes to about two minutes by co-ordinating the equipment and methods used. The test for leakage follows well-known lines, the safe limiting value of leakage current being set at 10 milliamperes at 10,000 volts. The basis of this reduction in time is a rotating holder devised by a member of the laboratory staff and illustrated herewith.

The customary tank for glove testing is in this case large enough to permit testing ten gloves at once. The tank is equipped with a swinging arm carrying ten individual metal glove holders, and the arm can be moved through 90 deg. by means of an external handle. In testing, the arm is swung above the surface of the water so that the glove holders are brought into a horizontal position as shown. The gloves are inserted in the holders, and the arm is swung back into the water, the end of its travel bringing the gloves into a vertical position in the water, which rises to within about 2 in. of the edge of the cuff. Water is introduced into the gloves one by one through a rubber hose with convenient valve above the group. Above each glove on a wooden bar is a binding post with chain for use as an electrode within the glove, each chain being wired to an insulated push button on a control switchboard. One side of these buttons is grounded, voltage being applied between ground and the metal tank. A milliammeter is so arranged that pushing any particular button causes the leakage current of the corresponding glove to be indicated on the instrument. This arrangement enables the leakage current of ten gloves to be readily observed within the required sixty seconds' time limit of the test. After testing, the rotation of the arm to the horizontal position automatically empties the gloves.

R. W. CHADBOURN.
Edison Electric Illuminating Company,
Boston, Mass.

Synchronous Motors for Industrial Drives

THE method of synchronizing a motor while on the starting tap at low voltage and then throwing over to full-line voltage was advocated by S. H. Mortensen in a paper on "Self-Starting Synchronous Motors and Their Application to Power-Factor Correction and Industrial Drives," presented before the A. I. E. E. section of the Western Society of Engineers on Jan. 15. He illustrated this point by showing the two "V" curves for a synchronous motor, one for half voltage and the other for full voltage. It was preferable to synchronize where these two curves cross each other rather than at the bottom of the curve, which would give rise to excessive armature current under full voltage.

Regarding the application for industrial drives, Mr. Mortensen listed

three things which were essential before any changes were made, namely, first to examine the details of the cable system from power stations with respect to the inductance of these lines; second, not to have the drive overmotored; third, consideration of the replacement of three or four small motors by one large-size motor.

Mr. Mortensen declared that synchronous motors for industrial purposes were now obtainable from 35 hp. up to 5,000 kva. The full-load losses of the last-named machine with proper design, he declared, would be only about 100 kva., with the no-load loss 50 kva. With regard to reciprocating loads such as air and ammonia compressors, care must be taken to keep the forced frequency of the load and the natural frequency of the motor at least 20 per cent apart, as otherwise the forced frequency will magnify the rotor swing and cause fluctuations in power input to the motor. The permissible value of the swing depends upon the relative capacity of the power feeder and the constants of the motor, but most compressor motors in successful operation limit this swing to approximately 60 per cent of the current fluctuation.

FIELD EDITOR ELECTRICAL WORLD.
Chicago, Ill.

Extracts from Operating Code

BY FIELD EDITOR ELECTRICAL WORLD
New York, N. Y.

Firing and Putting Boilers on the Line

BEFORE starting up a boiler and placing it on the line the steam-pressure gage and water column should be carefully inspected, the section of pipe between the main stop and automatic non-return valve should be drained and trap lines should be used to drain the condensate from the steam piping and prime movers. When the condensate from the steam piping and prime movers is not drained damage is often caused. Water should be turned on to the waterbacks before the fire is started, otherwise the waterbacks will become so hot that they will be cracked when cold water enters. At first raw water should be used to prevent taking too much condensate from other boilers.

Below are listed the directions for starting up a boiler and putting it on the line as abstracted from the operating code of the Philadelphia Electric Company:

PUTTING A BOILER ON THE LINE

1. Remove danger signs from main stop, main feed, blow-off valves and control board.
2. See that blow-off valves are all closed. Where a safety stop gate valve is connected to blow-off line see that this valve is open.
3. Open all vent valves.
4. Close all drain valves.
5. See that valves controlling water column and pressure gages are in operating condition and open.
6. Open the water-feed valves to the boilers slowly for one or two turns. On boilers equipped with separate economizers see that the valves between the boilers and economizers are open.
7. Fill the boiler to about one gage.
8. Open the superheater drains.
9. Start the stoker and fill the grate about half way down with coal.
10. See that the change-over valve on the waterback lines is set for raw water.
11. Open the feed and discharge valves on the waterbacks.
12. See that "telltales" are open and discharging water and that the drains are clear.
13. Turn on the spray of the clinker crusher pit.
14. Open the stack damper.
15. Dig holes in the coal over the tuyères and put a shovelful of fire in each hole or use wood and oil-soaked waste.
16. Cover the fire with "green" coal.
17. Start both the induced and the forced draft fans slowly. Have the electrician inspect the motor-driven forced and induced draft fans before starting.
18. Adjust the stack damper to proper draft over the fire.
19. Apply proper blast on the forced draft.
20. Close all vents on the boiler as soon as steam escapes.
21. Note that the pressure gage is operating.
22. Raise from 30 lb. to 50 lb. pressure on the boiler.
23. Close the drain valves on the superheater. These valves may be left cracked until the boiler is about to go on the line.
24. Increase the speed of the fans for both induced and forced draft to such a degree as may be required.
25. Bring the boiler gage pressure up to from 150 lb. to 180 lb.
26. See that the drain valves between the main and automatic non-return valves are open.
27. Open the by-pass valve of the main stop-valve and blow out all water from the gooseneck between the automatic non-return valve and the main stop valve.
28. Close the drain valves.
29. Open the trap line valve above the automatic non-return valve.
30. Open the main stop valve and close the by-pass on the same.
31. Unlock the automatic non-return valve when pressure has risen to within 50 per cent of the line pressure.
32. Increase the stoker speed and air blast until the boiler begins to steam. Keep the fire as light as possible. The rate of increasing the blast and stoker speed is determined by how fast the boiler must be put on the line.
33. Set the change-over valve on the waterback line for condensate.
34. Inspect all boiler-setting doors and see that they are tightly closed.
35. Blow down both water columns to check the water level.

Inspection of Rotating Electric Machines

GOOD electrical contact between brushes and commutator or slip rings is essential to prevent sparking and excessive heating. This can easily be obtained if the brushes are clean, free in the holder and under the proper spring tension and can, therefore, accommodate themselves to the surface of the commutator or slip rings. Very serious mechanical or electrical damage may sometimes be caused by small objects, such as bolts, nuts and screws left on or near a machine, which may be shaken down by vibration or drawn in by magnetic force. In the operation of all machinery one of the most important points to observe is to see that oil is properly fed to the bearings.

The acquiring of systematic habits in practice will go far toward preventing trouble and accidents, and the following rules abstracted from the operating code of the Philadelphia Electric Company should be of value:

INSPECTION BEFORE STARTING

1. Go over the machine carefully, inspecting alternating-current and direct-current brushes. See that they move freely in the holders, that they fit closely to the commutators and slip rings, that all connections are tight between brush holders, shunts and brushes, and that on rotary converters provided with brush-lifting devices the direct-current brushes, except the pilot brushes, are lifted off the commutator.
2. Examine all speed-limit devices and see that they are in proper operating condition.
3. Wipe off commutator, slip rings and brushes.
4. Examine the interior of the machine for foreign material and for visible damage to the insulation.
5. Remove all bolts, tools and foreign material which may have been left lying near the frame.
6. Examine bearing housings to make sure that there is the correct amount of oil in the wells and that the rings are free to turn.
7. Examine all switches to see that they are in proper position for starting.

INSPECTION AFTER STARTING

Immediately after starting and before putting on load examine all oil rings to make sure that they are turning over and carrying oil.

Central Station Business

Advertising, Selling and Service Methods
Commercial Organization and Management, Customer and Trade Relations, Public and Financial Policies, and Reports of Company Plans and Experiences

Simplified Rates a Good-Will Asset*

Complex Schedules Irritate the Majority of Residential and Small-Power Customers—Specific Instances—The Question of Discounts

BY A. S. PRATT
District Manager Stone & Webster, Inc.,
Boston

THE small house owner, the fellow who pays rent and the one who just lodges are quite fond of thinking of themselves as being more or less the "downtrodden" victims of the big business concerns and financial institutions on the street. When we enter upon a discussion of public relations these men come into their own, for they constitute the one important factor to be considered. In so far as the public utility is concerned, the financial and business sentiment of a city is likely to be relatively unimportant—if, in fact, it is not already sympathetic because of its better understanding of big business—but the chap who is so gleefully pictured by the "reform" newspapers as of the "common peepul" is the man whose tolerance and consideration we must win. And so our most important field for missionary work is that occupied by the residence lighting user and the small power consumer.

For a number of years the national associations and many companies have directed a very earnest and expensive campaign toward teaching the housewife and her husband the significance of a kilowatt-hour, and some even more optimistic and ambitious crusaders have still further refined their educational program by dilating upon the advantages of comprehending a watt. Possibly the progress made by those who have labored so long and heroically along this line has been satisfactory, but we might pause and ask "What of it?" What particular advantage is it to us for Mrs. Jones to know what a kilowatt is? She doesn't buy kilowatts and she doesn't use them. She does buy heat and light. Perhaps all of this is of no importance except to illustrate the angle from which a great industry may approach a desired objective. Apparently it has thought it necessary to force upon Mrs. Jones its own arbitrary terms rather than to permit her to be happy and contented in the use of her own. In any event it has not been notably successful. In the beginning it would have been far easier to have fitted our performance into the customer's requirements and mental state than has been the attempt to force him to fit his to our own.

*From an address before managers of Stone & Webster properties.

SOME RATES TOO COMPLEX

Some of the industry's rates are too complex. No doubt the various factors which enter into them are justified from the engineer's viewpoint, but the fruit grower who sought to sell peaches to the housewife at so much for the first "gazook" plus a service charge plus a charge because she didn't buy last week plus a half-dozen other factors of which she knows nothing and whose real existence she doesn't concede would carry his peaches home with him when the day came to a close.

Probably our busines is not so simple as selling peaches, but we might find it profitable to make it as nearly so as possible. Any rate other than a perfectly simple one contains elements of mystery to the consumer, and any human being is suspicious of anything he cannot understand. Perhaps much thought could be profitably expended in contriving simple rates which will bring in the revenue that a scientific analysis of conditions determines necessary, but which will be expressed in more or less general terms.

Not long ago a central-station company had occasion to seek an increase in its lighting rates before a city council. The rate expressed its intentions in the ordinary electrical nomenclature. The people were willing that an increase of some sort should be established, but would not accept the one proposed. After much fruitless negotiation and delay a committee of customers came before the city council with a rate schedule which it had prepared and which it was willing should be established. The company accepted it. It was a slightly higher rate than the company had proposed, but it was expressed in a manner that everybody could understand and every one was satisfied.

In a Western city the public became very much worked up over a lighting rate of 9 cents per kilowatt-hour which was locally in use. The agitation following a city election resulted in a situation where the city undertook to do its own retailing, purchasing energy from the old company at approximately 2 cents per kilowatt-hour. Under city management the ostensible rate became 3 cents, but it started off with a flat annual charge varying from $20 to $50. Actually it works out that the people are paying in the vicinity of 11 cents per kilowatt-hour but they are perfectly happy. The figure which really sticks in their minds is the 3 cents, and they appear able to forget the flat advance charge. Incidentally, the company is more prosperous than formerly, so every one is satisfied. Almost any resident of this city will descant upon how much cheaper lighting is than formerly.

Another company changed from the usual rate structure to one wherein cubic-foot content of used rooms is apparently the principal factor, and by so doing slightly raised its rates. This broke the back of an agitation for lower rates which threatened the utility's occupation of its field. This rate was actually more complex than the one it replaced, but it had the merit of being expressed in familiar terms. There are in existence in not a few com-

panies small-power rates which are so complicated that it would embarass many managers if they were asked to interpret them without prolonged study. Such a rate cannot possibly have an effect on the customer other than to weaken his confidence in the utility. He can never feel sure that he is paying only for that which he has used.

Large-power rates do not have the same effect on public relations as do the small-power tariffs.

A discount for a prompt payment of a bill is not a discount in any sense of the word. It is a roundabout and legal way of imposing a penalty for delayed payment. One of its disadvantages is that it is the gross rate and not the net which is fixed in the public mind when any discussion of rates is before it. One company has, for example, a gross rate of 10 cents for lighting, with a prompt payment discount of 25 per cent. Therefore the net rate is 7½ cents. Yet customers do not think of the rate as being the latter figure; it is always 10 cents in newspapers and elsewhere.

Abolishing Discounts

Some interesting experiments are being made in abolishing discounts. One company did this and in this way obtained a "chocolate-coated" rate increase. Of two others which have tried it, one reports that the change has made no material difference in collections, while the accounting department of the other questions the wisdom of the change while volunteering the information that collections appear to be pretty good so far. The advantage is that the abolition of the discount will make the rate appear to be lower and the consumer who fails to pay his bill on time is not penalized, as he generally believes, unjustly.

Dayton Company Rescues Municipal Plant

TROY, Ohio, has a municipal electric light plant and this plant has had more than its share of troubles. It has in the past few years encountered everything from inadequate equipment to internal dissension, and the citizens of Troy have suffered and lost money.

Recently the new plant which the municipality had been trying to make go this year gave up and quit. The system of the city of Piqua is owned by the Dayton Power & Light Company, and A. J. Patrick, the superintendent at that place, learned of the neighboring city being in darkness and communicated with the Dayton office to know whether it could help Troy out. O. H. Hutchings, general manager of the Dayton company, made the connection in a few hours by installing two 500-kw. transformers, building a line and stringing wires, crossing a railroad right-of-way underground with 33,000-volt conductors and building an outdoor substation and connection in Troy.

The city of Troy has spent approximately $300,000 on a plant, and the whole undertaking now appears to be a sorry mess.

The Banker's Side of Customer Ownership

Co-operation Between the Utility Company and Local Banks in Public Offerings of Securities Develops Good Will and Makes Financing Easier

WITH the increasing sale of public service company stock to customers and residents of the community served the attitude of local bankers is frequently a matter of concern to utility executives. At times the banker has looked somewhat askance at a customer-ownership campaign, for he felt that the utility company was encroaching too much upon his field. Again, when a drive for the sale of stock got under full swing, depositors have made rather heavy withdrawals from their bank accounts to purchase the stock, which, in the aggregate, temporarily disturbed the equilibrium of the banks' cash deposits. As a matter of fact, customer-ownership has always proved beneficial to the community by keeping investment money at home and forestalling wildcat speculation, encouraging thrift and, in the long run, increasing the deposits and business of the local financial institutions.

Most bankers, however, are far-sighted and therefore eager to co-operate with a company in customer ownership. They feel, and rightly, that they have a vital interest in every industry and business project of the community. The bankers' viewpoint was set forth in a most interesting manner by Robert Neill, vice-president of the Hot Springs National Bank, at the convention of the Arkansas Public Utilities Association in that city on Nov. 7-9. His statements are particularly pertinent and merit serious consideration by central-station officials when laying out a program and preparing the ground for the sale of securities locally. Pointing out that the local utility stock is a logical form of investment for its customers, Mr. Neill said:

> The discriminating public, while not always capable of analyzing balance sheets and earning statements, is inclined to invest in the things it knows something of, or at least of which it thinks it knows something, and it seems to me therefore that those concerns which serve the necessities of our every-day lives in these modern times come most readily to the minds of peop e who have a surplus and are looking around for a suitable investment. With our vanishing supply of firewood and bad labor conditions holding back coal production, gas and electricity are the only dependable sources of heat and light, and in this day, when rapid transportation facilities are imperative, I class these with food and raiment as our first necessities. You who are in the business of bringing these supplies to your respective communities should receive your public's first consideration when you have something to offer in the way of investment.
>
> The theory of profit sharing with employees in vogue in many of the industrial and manufacturing establishments of the country had its inception in the desire of the employer to get the benefit of a psychic feeling in the minds of his workmen that they were partners in his business. The same rule, broadened somewhat, is workable with the public you serve. Give them an opportunity of investing in your company to some extent, and they will have a personal interest in the well being of that company and assist in molding a favorable public sentiment toward your enterprise and organization.

Let the Banks Join in Selling Stock

Some of the largest stock issues of recent times have been disposed of on this plan, and in its ramifications the local banker should not be overlooked, for he helped finance all your projects at some stage of their development and perhaps took a chance with some of you which led to your success. The bank, as a rule, expects to be the custodian or depository for the funds of its public only for that period when a profitable investment may not be had, except, of course, as regards its active commercial accounts and those who are satisfied with the comparatively low returns of savings-bank interest. There is, however, a very comfortable proportion of the average bank's funds made up of deposits which are comparatively inactive, and these are the bulwark of the bank and its earning capacity.

When a utility corporation sets under way a program of permanent, or even temporary, financing in a public offering, that offering makes an appeal to the owner of this inactive bank account.

who proceeds to invest, sometimes seeking the advice of his banker and at others giving his check without explanation or comment. When your country banker sees his deposits going out in this channel it makes an impression. Therefore, I say that the course of some corporations which had stock issues to market of first interviewing local bankers and securing their co-operation in making sales, even at the expense of allowing a small brokerage, discloses good judgment. This is giving some measure of recompense for the banker's loss and is worth the cost to the corporation in good will. That may sound like the devil's theory that every man has his price, though I do not consider it so, for we all like to feel that we are getting an even break in all our business and commercial dealings.

Branch banking is rather irrelevant to the subject, but at this point it seems apropos to say that the individual, locally owned banking organization has been the cause of the rapid development of this big country of ours, and while no doubt this argument of centralized power, consequently cheaper power, applies logically to your line of business, I submit that it does not to mine. I confidently believe that a banking institution controlled and officered by individual residents in and conversant with their locality can much better serve that community than could the branch of some large bank operated by executives at a distant point who are not in sympathy, perhaps, with local plans and ambitions. The enlargement in the amount of money under the control of such an organization would not necessarily mean cheaper money, the probability being that your locally controlled bank would loan for local purposes more liberally in amount and rate than would its big rival.

What chance would a local utility have in securing help and co-operation in a local flotation of securities with a branch office of a non-resident banking institution? This is the application of branch banking to the subject in hand.

An Endless Chain of Prosperity

Any increase in the income of your utility due to legitimate causes means an increase in the banking business in your town. If you have to lay new mains or build new lines to serve new patrons in a new district, that means so many more people to earn and spend with your merchants and to deposit in your banks. An increase in power sales means another industry started which will furnish employment to more men to earn money to put in channels of trade, whence it gravitates to the banks.

It is an endless chain. The more general prosperity the more prosperous is the bank serving this community, for the bank which does serve its community makes its loans in such lines as will tend to build up and increase business and population, and it usually takes its losses with its community when business goes wrong and periods of depression set in.

Harmonious co-operation of component parts is necessary to make a smooth-running machine of any kind, and the banking interest is perhaps in the same boat with the public utility interest in that we are neither to be classed primarily as producers and are not therefore indispensable; for you know there was a time when there were no banks and folks carried their money in belts and there was a time when you had to use a pine torch or a tallow candle to make your way afoot to the stream where you quenched your thirst or took your bath. But who wants to live in those times again?

Having this community of interest, therefore, I believe even closer co-operation between banking and utility lines will be mutually advantageous, it being perhaps possible to reach the condition where financing will be done through your banker rather than through your broker or underwriter.

Good-Service Publicity Bears Fruit

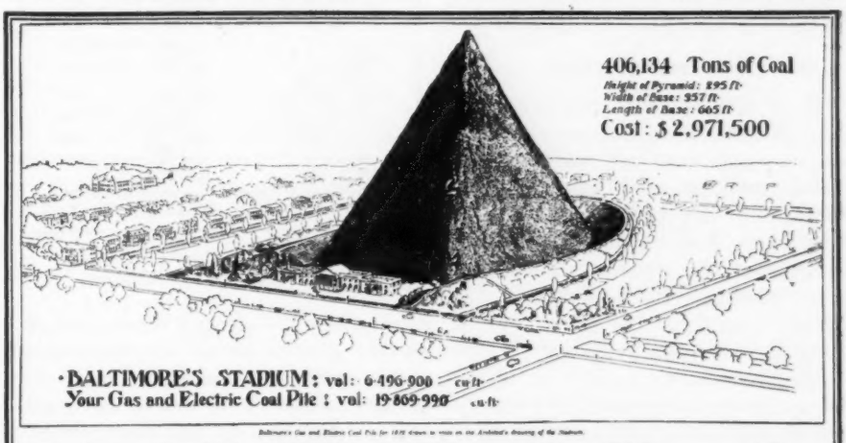
AS A MEANS of acquainting its customers and the public with the different phases of the work required to maintain a high standard of service, the Consolidated Gas, Electric Light & Power Company of Baltimore has for some time been running full-page advertisements which illustrate and explain many outstanding features about the company. One of the most interesting of the series, one which is particularly timely during the present coal stringency, is shown here. It gives a graphic picture of the company's fuel problem and visualizes to the public the magnitude of its operations.

All of the advertisements are written around the slogan "Good public service," and each carries the inquiry, "Is your service good? If not, please let us know." A most gratifying response to this effort to improve the service is seen in a letter from a customer which was published as one of the advertisements after the customer's permission had been obtained. Under the caption "One of Our Customers Writes a Public Service Advertisement" the letter read:

The Gas & Electric Company:

Gentlemen: Two men were discussing the series of "Good Public Service" advertisements now being published by the Gas & Electric Company. The suggestion was made that in covering the larger aspects of service the little items be not overlooked.

It is, of course, right to talk about the wonderful electric turbines on the Susquehanna and the high-power cable transmission line that brings the energy to Baltimore, but all this great equip-


406,134 Tons of Coal
Height of Pyramid: 295 ft.
Width of Base: 957 ft.
Length of Base: 665 ft.
Cost: $2,971,500
BALTIMORE'S STADIUM: vol: 6,496,900 cu. ft.
Your Gas and Electric Coal Pile: vol: 19,869,990 cu. ft.

A Coal Pile Three Times as Big as the Stadium Was Needed Last Year for Your Gas and Electric Service

Your Company burned 406,134 tons of coal last year to make Electricity and Gas for Baltimore. Of this 278,815 tons were used to generate electricity in the steam driven power houses, and 127,319 tons were burned at the gas manufacturing plant. The figures do not include the enormous tonnage used by the Bethlehem Steel Company at Sparrows Point, where part of Baltimore's gas supply is generated.

Your demand for light, heat and power required a coal pile three times as big as the Stadium.

In a year of coal strikes and transportation difficulties our plants were ready to serve you, *and serve you well*, at all times.

For every minute of 1922 we had to have ¾ of a ton of coal ready for use; for your service required 1112 tons a day and yet we used this coal so carefully and efficiently that we produced more electricity and gas from each ton of coal than ever before.

The year's coal supply required the movement of 7,384 freight cars of 55 ton capacity,—the equivalent of a train 51 miles long.

The coal is just one item. The plants, the distribution systems and a faithful, vigilant organization of 3,000 men and women were necessary in giving

Good Public Service

THE GAS & ELECTRIC CO.

Is Your Service Good?
If Not, Please Let Us Know

Telephone Plaza 8000
General Service Department

A GRAPHIC PORTRAYAL OF THE UTILITY'S FUEL PROBLEM

ment is valueless temporarily to the householder whose fuse blows.

It may seem to be just a matter of routine to be able to go to your telephone at any hour, as I did, and tell the company your lights are out and have a man at your side door, as I did, to fix the trouble in a few minutes, but it is more than that.

It is an evidence of the determination of the company organization to help in the little things for which there is no charge as well as in the more important service that shows on the monthly bill.

A burned fuse may not be important to the company engineers, but they know it is important to the family in a home gone suddenly dark with company at dinner, and they have organized to take care quickly of big-little emergencies like this, just as they have prepared to meet more serious accidents that might interrupt "good public service." A SATISFIED CUSTOMER.

Here is evidence indeed that the customer has gained a fuller understanding of the Baltimore company's business, and it shows the possibilities for building good will where the utility takes the pains to put its story honestly before the public.

Boston League Launches Electric Home

COINCIDENT with the organization of the Boston Electric League plans were approved for the establishment of an "electric home" group under the auspices of the central-station, jobbing and contracting branches of the industry in eastern Massachusetts. H. B. Gilmore was elected president of the league, Frank S. Price vice-president, Welles E. Holmes secretary, R. M. Miller assistant secretary and Rockwell C. Tenney treasurer. Fifty-three electrical men pledged their support to the league and its work. Committee chairmen elected were: Publicity, L. D. Gibbs; wiring and illumination, I. L. Matson; appliances, K. L. Norris, and house manager, W. J. Freethy.

The Boston "electric home" project is being conducted through the co-operation of prominent real-estate men and house-furnishing firms with the league, and it is planned to open the first home in Newton, Mass., April 14 and to exhibit it until May 5 on weekdays, for subscribers from 10 a.m. to noon and for the public from 2 to 10 p.m. The home is to be run on a purely educational basis, without distinctive identification or demonstration of appliances. Other homes will be established later in other places in eastern New England.

A Decisive Victory for the Electric Truck

BACK of the accompanying advertisement offering at auction the complete delivery equipment of a baking company is a most convincing piece of evidence of the superiority of the electric truck for city delivery. As stated in the advertisement, the equipment was disposed of because the owner, the Wagner Pastry Company, Newark, N. J., was changing to electric trucks. This move is largely the result of missionary work and co-operation on the part of the electric vehicle department of the Public Service Electric Company in Newark, and R. R. Young, new-business agent of the company, in telling of the change-over says:

"The Wagner Pastry Company is

AUCTION OF DELIVERY EQUIPMENT

DON'T FORGET ON DECEMBER 15

WE WILL SELL FOR THE WAGNER PASTRY COMPANY, NEWARK, N. J., AT PUBLIC AUCTION, WITHOUT RESERVE, TO THE HIGHEST BIDDER, THEIR ENTIRE DELIVERY OUTFIT OF HORSES, WAGONS, HARNESSES AND GAS AUTOMOBILES, ALL IN FIRST-CLASS CONDITION, ON ACCOUNT OF THEIR CHANGING TO ELECTRIC TRUCKS, ON FRIDAY, DECEMBER 15, 1922, AT 10 A. M., AT THE COMPANY'S STABLE, VESEY STREET, NEWARK, N. J., CONSISTING OF—

57 Horses
7 Mules
32 Top Wagons
1 Concord Buggy
2 Double Trucks
14 Sets Single Harness
21 Sets Double Harness
90 Collars
1 Set New Single Harness
1 Horse Swing
1 Oat Crusher
Blankets
Stable Utensils

6 1922 1-Ton Ford Trucks with Bodies.
2 1922 1-Ton Ford Truck Chassis.
4 1922 ½-Ton G. M. C. Truck Chassis.
3 1922 ½-Ton G. M. C. Trucks with Bodies.
7 2-Ton Pierce-Arrow Trucks with Bodies

These Cars are all in first-class mechanical condition.

The Vogel & Schonfeld Commission Stables

H. M. VOGEL, Prop. JOHN S. WILLIAMS, Auctioneer

For Particulars Phone Market 8792

ELECTRICS DISPLACE GAS TRUCKS AND HORSE-DRAWN WAGONS

purchasing 177 electric trucks, which, so far as we know, is the largest single order that has been placed for these vehicles. They are to supersede the gasoline trucks and horse-drawn vehicles used by the baking company on its delivery routes, which now cover a total of 3,500 miles daily.

"The Wagner Pastry Company first began to experiment with electric trucks about fifteen months ago, when it ordered six wagons from the Commercial Truck Company and several of other makes. These were tried out on all of the company's routes. To prove beyond a doubt that electric trucks would be satisfactory the tests were continued for fifteen months. The results proved that electric trucks are more satisfactory than any other type of delivery equipment.

"The trucks were used for a whole winter, careful records being kept of the various items of cost. W. J. Bittles, president of the Wagner Pastry Company, stated: 'We expect to save $100,000 a year with 70 of these trucks at our Newark plant, where they will replace an equal number of gasoline trucks and wagons.'"

Data covering the tests and performance of these trucks, with which it was decided to replace all of the gas trucks and horse-drawn wagons, will be published in a later issue of the ELECTRICAL WORLD.

What Other Companies Are Doing

New York City. — Results of a census of electric signs by the New York Edison Company shows that there are 9,577 electric signs along Broadway and all other streets in the five boroughs of New York. More than a million lamps of various kinds are used in these signs. Of these lamps 947,623 are the 10-watt size.

Fitchburg, Mass.—The Fitchburg Gas & Electric Light Company, F. S. Clifford, sales manager, sold 400 table, bridge, floor and boudoir lamps during the year just ended and a total of 1,381 other major appliances which are estimated to add about 71,000 kw.-hr. to the system's output per year.

Hartford, Conn.—Appliance sales of the Hartford Electric Light Company for 1922 totaled about $155,000 against about $107,000 for the preceding year. January, 1923, sales ran about one-third ahead of the corresponding month last year. Improving industrial conditions, active merchandising effort and a rate composed of an area charge and a 6-cent energy charge have all been factors in the above results.

Vancouver, B. C. — To the Oak Bay district, served by the British Columbia Electric Railway Company, goes the honor of serving the first permanent entire electrical home. This place is not for demonstration purposes, but for ordinary occupation. The residence is a bungalow which, besides having an all-electric kitchen, is completely heated electrically. The connected load is approximately 25 kw.

Springfield, Ill.—During the five weeks ended Dec. 30, 1922, the Central Illinois Public Service Company gained 650 electric customers, sold merchandise to the amount of $49,861.01, connected to its lines 351 kw. of lighting load and 1,963 kw. of power load and contracted to serve 7,199 kw. of additional power load.

Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
from All Parts of the World

Hydro-Electric Development and Steam Equipment

Comparing Value of Power-Plant Fuels.—G. M. LEVY.—A graphic method of computing cost of steam generated with oil or coal as fuel is described. Three charts are included for determining the cost of steam with various fuels, steam costs for varying efficiencies, heat values and coal costs, using both 2,000 lb. and 2,240 lb. as making a ton of coal.—*Power Plant Engineering*, Dec. 1, 1922.

Modern Boiler-Feed Regulation.—E. W. NICK.—A regulator that feeds a boiler continuously as long as it is under load, but at the same time lowers the water level during peak and overloads so as to increase the steaming capacity and during subnormal and no loads raises the water level so as to conserve the energy which would otherwise be wasted is the subject of this article.—*Sibley Journal of Engineering*, November and December, 1922.

Furnace Maintenance with Pulverized Fuel.—M. W. ARROWOOD.—The effect of imperfect mixing in causing overheating of brick surfaces, abrasion of eddying currents, efficient firing and maintenance are points in connection with the pulverized-fuel system that are discussed in the article.—*Iron Age*, Dec. 21, 1922.

Combustion of Bituminous Coal.—R. REDDIE.—The author discusses in a practical manner boiler-furnace material, the action within the furnace during combustion, elementary chemistries of combustion, etc.—*National Engineer*, December, 1922.

Generation, Control and Switching

Electric Generator Troubles.—R. L. TULLIS.—Failure of the power and light generating equipment of a large institution with its own power plant sometimes calls for quick thinking and action on the part of the engineer. Some of the most common troubles that arise and methods for overcoming these are described.—*National Engineer*, January, 1923.

Causes of Reversed Polarity in Direct-Current Generators.—CLARENCE LYNN.—A number of conditions that may cause reversal of polarity, with methods for correction, are discussed.—*Power*, Jan. 9, 1923.

The Applications of Relays.—L. A. TERVEN.—The most common method of protecting alternating-current apparatus against internal faults is by means of current overload relays. This is really an application of the differential current relays, where the current entering a transformer and leaving it is made to pass through a relay which trips out the circuit when there is an unbalance within the transformer. The general application of this form of relay for various types of electrical apparatus is described.—*Electric Journal*, December, 1922.

Transmission, Substations and Distribution

Corrosion of the Lead Sheaths of Cables by Water Seeping Through Concrete.—G. C. BUNKER and A. H. KHACHADOORIAN.—The cost of the repairs to the control cables at the Miraflores locks of the Panama Canal is large enough to call attention to the breakdowns and damages liable to result to unprotected cables installed in damp locations in concrete-covered duct lines and to merit a careful study of the conditions of each installation so that similar failures may be avoided. To prove that the water in the lock chambers, after dissolving lime salts from concrete, would attack lead several laboratory experiments were made, the results of which are narrated.—*Journal of the Worcester Polytechnic Institute*, November, 1922.

Full and Semi-Automatic Versus Manual Operation for Substations.—C. M. DAVIS.—A statement of the principles involved, showing that the interurban railway application is simpler than the urban, but that labor, feeder copper and incidental savings in general more than offset the fixed charges on the additional investment, is the most important part of this paper, presented at the annual meeting of the Central Electric Railway Association, Louisville, Jan. 18.—*Electric Railway Journal*, Jan. 27, 1923.

A Low-Voltage Cathode-Ray Oscillograph.—J. B. JOHNSON.—In the new type of Braun tubes low-voltage operation has been obtained by the use of a Wehnelt cathode as the source of electrons, so that the lower limit of voltage is set by the effect of the electrons on the fluorescent screen and not by the voltage needed to obtain the electrons. The tubes are designed to operate at 300 volts to 400 volts.—*Electrical Communications*, Vol. I, No. 2.

Units, Measurements and Instruments

Magnetic Observations by United States Coast and Geodetic Survey in 1921.—D. L. HAZARD.—A comparison of the declination results obtained at repeat stations throughout the United States, Alaska, Hawaii, Porto Rico, the Virgin Islands and Siberia during 1921 is given. The results of earlier observations in the same localities are presented in table form. The investigations indicate that in the past few years there has been little change of declination in the southwestern part of the country and a decrease in the northwestern part.—*Serial No. 205 of the United States Coast and Geodetic Survey.*

Illumination

Recent Developments and Modern Requirements in Street Lighting.—H. T. HARRISON.—In a paper presented before the British Illuminating Society the author refers to the great importance of good public lighting in promoting order and safety in the streets. The burden of rates is one reason why progress has been delayed, but improved street lighting need not always be at an increased expenditure. He also pointed out that the classification of streets on the basis of minimum horizontal illumination by joint committees on this subject in England and the classification by the street lighting committee of the N. E. L. A. were in close accord as to the amount of light.—*Electrical Times*, Dec. 28, 1922.

Equipment to Improve the Lighting of Homes.—P. C. KELLER.—The problem of lighting homes already occupied is radically different from that of designing proper illumination for a house in course of construction. This article presents a survey of suitable equipment with suggestions for simple demonstrations to show the advantage of good practice as compared with bad, and it pictures equipment suitable for carrying on this work.—*N. E. L. A. Bulletin*, January, 1923.

Motors and Control

Applying the Electric Motor to the Pulp Industry.—GORDON FOX.—The heavy machinery used in the manufacture of pulp for paper making is well adapted for motor drives. A detailed description of these drives is given.—*Power Plant Engineering*, Dec. 1, 1922.

Determining the Performance of an Induction Motor Without Plotting a Circle Diagram.—G. T. SMITH.—A method is described for determining induction-motor characteristics that is easier than the circle diagram and has the added advantage that the accuracy of the result is not dependent upon reading values from charts. The method is in fact the circle diagram put into mathematical terms.—*Electric Journal*, December, 1922.

Operation of Direct-Current Motors.—E. C. PARHAM.—Features of application and operation, characteristics of different types and troubles encountered and their remedies are the chief points considered.—*National Engineer*, January, 1923.

Production of Noise and Vibration by Squirrel-Cage Induction Motors.—F. T. CHAPMAN.—A suggestion is made that the high-pitched notes emitted by some induction motors are due to a side pull arising from an unsymmetrical field which may be produced when cer-

tain numbers of rotor slots are used. A simple case is first considered and the dissymmetry shown, the forces produced being indicated and their effects considered. The motor field is analyzed, and it was found to include pairs of components such that in each pair the numbers of poles differ by two. *Institution of (British) Electrical Engineers*, December, 1922.

Heat Applications and Material Handling

Coal Handling and Electricity Supply.—G. F. ZIMMER.—When coal is received by both railway and waterway the difficulty of handling is much greater than if coal is received at one source only. At the Blackburn (England) power station a novel traveling crane is employed that can either take coal from a barge or pick up railway cars bodily and empty them into the storage yard.—*Electrician*, Dec. 29, 1922.

Electric Welding of Storage Tanks.—Report of the American Welding Society committee, working with the American Bureau of Welding, on the specifications for the welding of a 5,000-barrel tank by the electric process. Specifications are included in the report.—*Journal of the American Welding Society*, December, 1922.

Ferro-Alloys and Hydro-Electric Power.—F. A. J. FITZGERALD.—The author contrasts the popular clamor for the benefits of cheap electricity from water power with the propaganda designed to discourage the reasonable use of such natural resources as Niagara Falls. Demand for ferro-alloys is increasing, and the question is raised as to where the great quantities of cheap electric power which are needed for the natural growth of the ferro-alloy industry are to come from.—*Iron Age*, Jan. 4, 1923.

Electrophysics, Electrochemistry and Batteries

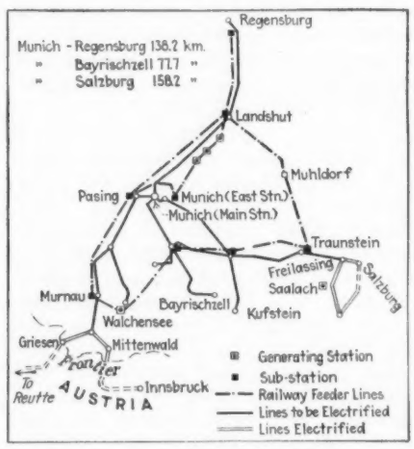
Five-Wire Balancers for Charging the Batteries of Electric Vehicles.—J. P. KEMP.—The advantages of the five-wire system for charging electric storage batteries are outlined. A table shows the cost of such a system as compared with the cost of an ordinary motor-generator set operating directly from 440-volt mains, and a detailed description is given of the five-wire system. The method of employing the balancer set is explained.—*Electric Vehicle*, November and December, 1922.

Atomic Systems Based on Free Electrons, Positive and Negative, and Their Stability. — R. HARGREAVES. — In the atomic scheme, of which a planetary system is the model, negative electrons have the position of planets and a positive charge is condensed at a central nucleus. It is then postulated from experience — chemical, electrical and spectroscopic—that the nucleus shall contain an integral number of standard charges. The question of how far these structures, regarded as representations of the atom, meet the demands from the various branches of physics and chemistry is a fundamental one to which the author devotes forty pages.—*Philosophical Magazine*, December, 1922.

Vapor Recompression Systems for Evaporators.—W. L. BADGER.—A technical history of regenerative evaporation, enumerating the advantages and shortcomings of this system, is given. This is followed by an analysis of recorded data on test runs, a critical discussion of the regenerative evaporating system with particular reference to the general theory of design and construction, comparison of operating economies with single and multiple-effect evaporators and a bibliography of patents and literature references.—*Chemical and Metallurgical Engineering*, Jan. 3 and 10, 1923.

Traction

Electric Traction in Bavaria.—B. GLEICHMANN. — The electrified lines and proposed lines in Bavaria are shown in the accompanying illustration. Electric operations began in 1912 on the Mittenwald Railway, power being supplied at 50,000 volts from the Reutz works. The system adopted was single-phase at 16⅔ cycles, with overhead-conductor pressure of 15,000 volts



ELECTRIFIED RAILWAYS IN BAVARIA

in conformity with the system used in other German states which have adopted electrification. The extensions since that time, working costs, sources of supply and details of system employed, as well as the advantages of the single-phase system used, are among the factors discussed.—*Electrician*, Jan. 5, 1923.

Electric Locomotives for Norfolk & Western Railway.—Four double-unit 4,000-hp. locomotives are under construction for the Norfolk & Western Railway's Elkhorn grade and electrified extension. These will supplement twelve lighter locomotives that have been in service since 1915. A general description is given of these locomotives, including the equipment that they will carry.—*Electric Railway Journal*, Dec. 30, 1922.

Telegraphy, Telephony, Radio and Signals

Characteristics of 5-Kw. Elwell-Poulsen Arc Generator.—A. T. C. MOORE.—Tests were made on this type of generator to determine the distribution of transverse magnetic field in the air gap, the effect of magnetic field on the magnitude of the high-frequency current, and the relation of wave lengths to the high-frequency current, the generator operating with the field coils connected in series with the arc.—*Engineering*, Dec. 8, 1922.

An Electron Tube Amplifier.—P. D. LOWELL.—The apparatus described is an amplifier developed by the Bureau of Standards using a crystal detector and five stages of amplification, three stages of radio-frequency amplification and two stages of audio-frequency amplification. The tubes are energized from a 60-cycle supply for both filaments and plates. Circuit diagrams and values of condensers, resistors and inductors used are included.—*Scientific Paper No. 450 of the Bureau of Standards.*

Calculation of an Antenna.—F. PERRIN.—The author shows the way in which a somewhat unusual antenna was calculated for its mechanical strength and its electrical characteristics. The efficiencies of this antenna are then investigated mathematically for five different wave lengths.—*Revue Générale de l'Electricité*, Dec. 23, 1922.

Miscellaneous

Reclamation of Used Petroleum Lubricating Oils.—W. H. HERSCHEL and A. H. ANDERSON.—Used lubricating oils may be reclaimed by apparatus already commercially available and thus saved for further use. Such reclaimed oils will pass all the commonly accepted tests for new oils, such as flash point, viscosity and sediment. It is often the case that high acidity is accompanied by readiness of emulsification, but exceptions have been found, so that the value of the test for acidity must lie in the possibility that an oil of high acidity will not prove durable in use. Important points discussed are the deterioration of lubricating oils in use, present methods of reclaiming used oils, tests with motor-oil purifier refining processes and the cause of sludge formation.—*Technologic Paper No. 223 of the Bureau of Standards.*

Neon-Glow-Discharge Lamp on Alternating-Current Circuits. — R. A. BROCKBANK and L. E. RYALL.—After giving the various characteristics of this type of lamp by means of numerous curves, the author suggests further experiments that should be carried on to determine future applications. Among these experiments would be a detailed study of the lamp for stroboscopic purposes at all frequencies, a study of the photometric properties of the lamp and experiments to determine the possibilities of its use for photographic purposes. — *Electrician*, Jan. 5, 1923.

New Books

Reviews of the Latest Contributions to Technical, Industrial and Commercial Literature of Particular Interest to Members of the Electrical Industry

Theoretical and Practical Electrical Engineering

By Louis Denton Bliss. Vols. I and II. Washington, D. C.: Bliss Electrical School. 1470 pages.

This treatise includes a very complete discussion of the fundamentals and application of electrical phenomena. The descriptions are, in general, clear without the use of mathematics. A much larger range of electrical applications is included than in the usual textbook. A large number of illustrations are used to illustrate fundamental principles and wiring connections. Complete machines are illustrated as well as their constructional features. Historical facts are introduced in a manner to add interest.

There may be exceptions taken to a few explanations of certain features of electrical apparatus. In the treatment of generators the fact that field distortion is corrected by commutating poles is emphasized. This, of course, is not true except at the point of commutation. In a later discussion on commutating-pole motors this point is clarified. In describing three-wire generators with balance coils an incorrect statement is made, that the current in the outside wires is continuous while the current in the middle wire pulsates between points of maximum and zero value. Obviously any pulsation in current must be the same throughout the circuit and will be small as it is due to the varying resistance in the armature circuit and leakage reactance of the balance coil. The treatment of the transformer is very good in detail and introduces a more accurate conception of leakage flux than can be gained from many textbooks.

The subjects covered include static electricity, electric circuit, magnetic circuit, electromagnetic phenomena, wiring for bells, lighting, etc., measuring instruments and use of same, direct-current generators, boosters and motors, alternating-current principles (with the minimum of mathematics), alternators, transformers, synchronous motors, induction motors, synchronous converters with their modern developments, phase advancers, single-phase induction motors, and commutating motors both single-phase and polyphase.

Applications of electrical apparatus are also described, with the modifications for the particular application, including electric elevators, automobile engine ignition, starting and lighting, electric railways, communication and illumination. The power system is treated by a brief description of prime movers as well as an account of power transmission by various systems and power station protective and metering devices.

From the standpoint of instruction the questions at the end of each chapter serve to emphasize the important facts of the chapter. However, a larger number of numerical problems might be used to clinch certain facts.

The completeness and simple treatment of electrical phenomena should give these two volumes a definite place among electrical engineering literature, particularly for the man who has not been able to keep up with the development of modern apparatus or who has not been fortunate enough to have a college education. R. G. WARNER.

André Marie Ampère, 1775-1836

A special issue of the *Revue Générale de l'Electricité*, dated November, 1922, is dedicated to the memory of Ampère. This elaborate publication of more than 300 pages contains nine chapters of a biographical nature dealing with the life and achievements of the great French electrophysicist. Then follows a description of the recent centennial Ampère festival in France, all the addresses being published. The second half of the book gives descriptions of the salient features of forty of the most important electrical generating centers of France. The first part of the book will be of great value to the historian and bibliographer, and the second part will serve as an excellent and up-to-date reference book on the existing electric systems of France.

Principles of Electric Spark Ignition in Internal-Combustion Engines

By J. D. Morgan. London: Crosby, Lockwood & Sons. New York: D. Van Nostrand Company. 92 pages with diagrams.

This is not a book describing the construction and operation of electrical ignition apparatus, which fact makes it unique in the literature of electrical ignition. It presents the physical facts underlying gas ignition. The treatment is purely physical and descriptive, with an almost complete absence of mathematics.

The discussion covers such matters as gas characteristics (inflammability, rate and manner of flame propagation), spark characteristics (capacity and inductance components of spark currents), effects of sparks on gases, effect of spark-gap form on sparks and ignition, effects of inductance and capacity of spark generator and spark circuit, and effect of resistance leak across spark gap. The subject matter is in part a collection of information scattered through technical journals, but more largely the result of the author's own investigations. The presentation is pleasantly clear and comprehensible. Intended primarily for the designer of gas engines or ignition equipment, the book is of interest and value to any engineer who drives a car and is interested in its operation. W. B. HALL.

The Lead Storage Battery

By H. G. Brown, A.M.I.E.E. London: The Locomotive Publishing Company. 162 pages, 60 illustrations.

The fundamental theory of the lead storage battery is very well set forth in this book and in terms that will be found quite clear to a reader not thoroughly posted in electrochemical theories.

In taking up the description of different types of plate and cell assemblies and various storage-battery applications, including details of installation and auxiliary apparatus, however, the book is practically limited to English practice. In many respects European practice is so different from that in this country that the descriptive matter is of little value and may in some cases be actually misleading to one who is looking for information in regard to storage-battery practice in the United States. For example, the discharge curves given in Fig. 7 on page 17 show final voltages which are considerably higher throughout the entire range of discharge rates than those which have been established as standard in this country. As another example, on page 27 the statement is made that the Planté positive is without a serious rival for stationary battery work. In this country the Faure, or pasted plate, has been almost universally adopted for standby service for the large standby batteries in central-station lighting systems.

In many places the descriptive matter reveals a prejudice on the part of the author in favor of the product of a particular manufacturing company, which is rather unfortunate in a book supposed to deal with the subject generally and from an unbiased standpoint

Some of the fundamental data do not appear to be quite correct, such as the curve given in Fig. 3, page 11, showing the variation of open-circuit voltage with acid density. The temperature at which this curve is intended to be used is not given, but if a temperature of 80 deg. F. be assumed, which will make the highest point on the curve correct, the rest of the curve is too high.

Books Received

Practical Tests for the Electrical Laboratory. By Chesley H. Johnson and Ralph P. Earle. New York: D. Van Nostrand Company. 347 pages, illustrated.

Engineering Economics. By John Charles Lounsbury Fish. New York: McGraw-Hill Book Company. 311 pages.

Rate Making for Public Utilities. By Lamar Lyndon. New York: McGraw-Hill Book Company. 209 pages.

Lehrbuch der Praktischen Physik. By Friedrich Kohlrausch. Leipzig: B. G. Teubner. 802 pages, illustrated.

News of the Industry

Chronicle of Important Events and General Activities, Announcements and Reports of Association Meetings, Court Decisions and Commission Rulings and News of Electrical Men

Reorganization of Northern Illinois Company

The Public Service Company of Northern Illinois on Feb. 6 announced the executive reorganization of the company to meet exigencies created by the death of Frank J. Baker, vice-president of the company. Samuel Insull resigned from the presidency to become chairman of the board with general authority over the company's affairs conferred by amendments to the bylaws. Britton I. Budd, president of the Chicago Elevated Railroads and the Chicago, North Shore & Milwaukee Railroad, was elected president; John G. Learned was elected vice-president in charge of the commercial and new-business departments, and Julius L. Hecht was made vice-president in charge of engineering and operation. Charles A. Munroe resigned as vice-president, but retains his position as a director and a member of the executive committee. John H. Gulick remains vice-president in charge of finances.

Carrier Current in Operation at Hartford

One of the "wired-wireless" installations now being made by central-station companies as an aid to operation has, with characteristic enterprise, been put into use by the Hartford (Conn.) Electric Light Company between its South Meadow and Falls Village generating stations. This installation differs from others in that it is the first one to be made on a long rambling transmission line with numerous taps. A frequency of 13,000 cycles is used, and the sound wave is impressed on the 66,000-volt transmission line through a coupling wire which is about 1,000 ft. long and runs parallel to and within a few feet of the high-tension wires.

The transmitter contains two 50-watt tubes. When the microphone is spoken into, the voltage on the grid of the second tube, called the modulator, is varied. This in turn creates a much greater variation in the current flowing from the plate of this tube to the filament. Since the plates of the modulator and oscillator tubes are connected in parallel, the current in the plate of the oscillator will vary, and this causes a variation in the amplitude of the oscillations generated; in other words, the voice frequency is carried along with the carrier frequency. The receiving unit contains three tubes, a detector and two amplifiers. Different combinations of tubes may be used for receiving the calling and taking frequencies. The receiving tubes burn constantly and a switch is so connected that while one battery is lighting the filaments another one is being charged.

News from the Capital

Ford Bill Doomed — Radio Bill Meets Obstacle—Ratification of Colorado Treaty in Doubt

ALTHOUGH the announcement by Representative Madden, the chairman of the appropriations committee of the House, that he regards it as desirable for Congress to accept Henry Ford's Muscle Shoals proposition did much to stimulate the flagging hope of the advocates of that proposal, the Washington correspondent of the ELECTRICAL WORLD reports that it apparently has brought the realization of those hopes no nearer. It is admitted that support from such a prominent member of the House of Representatives is a great asset to the advocates of the Ford offer, but it is an asset which will be of little service in this Congress, since it is conceded that no vote can be had in the Senate at this session. The bill, therefore, will die with the Congress on March 4.

The radio bill is in a very difficult position in the Senate. Its passage virtually depends on its receiving unanimous consent. This seems improbable owing to the fact that a number of Senators are insisting that action wait on an international agreement. Secretary Hoover, however, has taken pains to call attention to the fact that a recent federal court decision does away with every shred of authority which his department has been exercising over radio matters.

Doubt as to the ratification of the Colorado River compact by Congress at this session has been expressed by Secretary Hoover. Delay on the part of Arizona and Colorado in securing its ratification by their legislatures has precluded consideration of the compact by Congress so long that, in the face of the usual congestion of legislation at the close of the session, federal action, even if those states should take belated action, is endangered. Mr. Hoover emphasizes the responsibility which those states are assuming in delaying works of flood protection and those necessary to the utilization of the resources of the river. He points out, however, that failure on the part of the legislatures of Arizona and Colorado as now constituted in no way impairs the existence of the compact itself, which can be ratified at any future time.

Edison Seventy-six Years Old Tomorrow

Tomorrow, Feb. 11, Thomas A. Edison will be seventy-six years old. There will be no celebration on Sunday, but on Monday the Edison Pioneers, composed of Mr. Edison's associates between 1885 and 1900 and the descendants of his associates before 1885, will hold their annual meeting and luncheon in the Edison plant at West Orange, N. J. Mr. Edison's presence at this luncheon is always an event of great interest to his old associates.

No special program has been arranged. Samuel Insull, president of the Edison Pioneers, will speak. John W. Lieb is chairman of the dinner committee, other members of which are C. E. Esterbrook of the General Electric Company, F. A. Scheffler of the Fuller Engineering Company of New York, vice-president of the Pioneers; William H. Meadowcroft, confidential secretary and personal representative of Mr. Edison, and Frank A. Wardlaw, curator of the Museum of Edisonia and secretary of the Pioneers.

Radio Monopoly Debated in Congress

Just previous to the passage of the administration's bill for the control of radio, reported in last week's issue, a lively debate arose in the House of Representatives over the clause authorizing the Secretary of Commerce to refuse or revoke licenses in cases where a monopoly of radio transmission was threatened. Representative Jones of Texas led in an attempt to have the Secretary "directed" instead of "authorized" to revoke or refuse licenses in such cases and also to give to any one whose application had been refused or permit revoked or suspended the right to appeal to the courts, the Secretary's order to remain in force pending judicial decision. Mr. Jones declared that there was grave danger of a monopoly in the radio business by four great companies.

As named by Representative Jones in speaking to his amendment, these are the American Telephone & Telegraph Company and the allied Western Electric Company, the Westinghouse Electric & Manufacturing Company and the American Radio Corporation. In pursuing his remarks, however, he brought in also the General Electric Company.

The proposed amendments were defeated and the refusal or revocation of licenses because of monopoly was left to the decision of the Secretary.

Miller's Quarter Century

President Southern California Edison Receives Congratulations on His Twenty-five Years' Service

A BANQUET long to be remembered by those in attendance was given at Los Angeles last week to John B. Miller, president of the Southern California Edison Company, in celebration of the completion of his twenty-fifth year of service with that company. The event, which was participated in by three hundred executives, engineers and district managers of the company, served to drive home again the ideal of service that has made possible the building of this company's great network. G. C. Ward, vice-president in charge of operation and construction, speaking at the banquet, delcared that this ideal was what had made possible the budget of new expenditures for 1923 of $26,000,000 and the coming drive for an additional connected load in the present year of 100,000 hp. or more.

Vice-president S. M. Kennedy read a score of congratulatory letters and telegrams from leaders of the electrical industry, among them Thomas A. Edison, C. A. Coffin, Frank W. Smith, Joseph B. McCall, Charles L. Edgar, Samuel Insull, W. E. Creed, John A. Britton, H. M. Byllesby and James H. McGraw.

Roy V. Reppy, chief counsel of the company, said Mr. Miller had "built not only physical transmission lines, but a human co-operative association that with its high ideals, its loyalty and its enthusiasms has shown to the people that a corporation is indeed possessed of a soul." Vice-president W. A. Brackenridge presented the twenty-five-year service button to Mr. Miller, saying that it was a symbol of the untiring effort he had displayed in behalf of the public.

TRANS-ROCKY MOUNTAIN PROBLEMS

Mr. Miller in his response told his hearers that west of the Rockies lay 70 per cent of the undeveloped water powers with only 8 per cent of the industry of the nation. He said his vision had been to transport the industrial scenes of the East, where 42,000,000 hp. developed by steam is now used, to the West coast, where lie such vast untouched water powers.

Referring to the subject of the Colorado River and its development, alluded to in the congratulatory telegram of James H. McGraw, Mr. Miller said: "I am glad that the subject of the Colorado has been alluded to this evening. We do not as yet need the Colorado, but we stand ready to go into the Colorado if permitted to do so and carry out this great work. We are now doing work of equal magnitude, and should we undertake this development we should like to proceed in the same way we have proceeded in the past. We should like to have as partners all the people of the Colorado River Basin. We believe that such a system of development works the highest justice in economic service to the consuming public, to the employees and to the investor."

R. H. Ballard, vice-president and general manager of the company, presented to Mr. Miller a painting of a California hillside, a gift to the president from the eight thousand employees of the company.

Ten-Year Program Beginning in Southern California

The first step in the ten-year construction program of the Southern California Edison Company, the final cost of which is estimated at $375,000,000, will be the erection of a substation in the Vernon district of Los Angeles to serve as a distributing center for power brought from the Big Creek developments. The substation, to be known as the Laguna-Bell terminal station, will have a rating of 160,000 hp., will be of the outdoor type and will cost approximately $2,000,000. Work will begin in the near future. The structure will be of the most modern type and will receive power over a new extension of the Big Creek transmission line. The connection will be made by a trunk line, 30 miles in length, which will join the main trunk line at Eagle Rock.

According to George C. Ward, vice-president in charge of construction, the entire construction project, when completed, will develop in the neighborhood of 1,250,000 hp. The power will be distributed to most of the counties in southern California.

Solid Building Justified

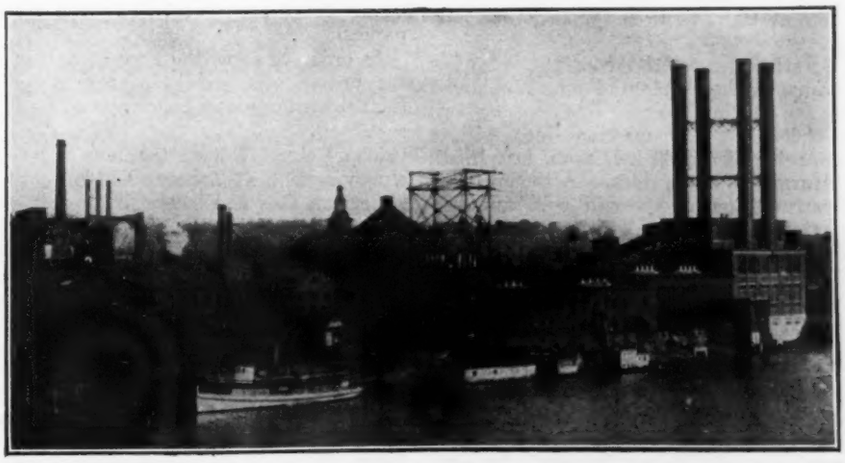
Springfield (Mass.) Central Station Unscathed When Adjacent Gas Tank Explodes

ELECTRIC service at Springfield, Mass., sustained no interruption and the property of the United Electric Light Company, the Springfield Street Railway, the Turners Falls Power & Electric Company and the New England Telephone & Telegraph Company escaped serious damage when a purifying tank at the works of the Springfield Gas Light Company exploded in the early afternoon of Feb. 1, although three persons were killed in the disaster, about a hundred injured and downtown property suffered an estimated loss of $500,000. The main steam plant of the United company is on the east bank of the Connecticut River within about 75 ft. of the gas plant, a recently completed boiler house and switch house facing the main line of the New York, New Haven & Hartford Railroad which divides the two properties. About 55,000 kva. in generating equipment is in service and the boiler plant is surmounted by four steel stacks 197 ft. high, supported on the framing of the building. In the switch house are the operating headquarters of the United system, and a 66,000-volt interconnection with the Turners Falls system spans the river at this point, terminating on a steel structure at the top of a transformer house at the north end of the station.

The explosion destroyed 90 per cent of the windows of an older portion of the station and several in the newer section, bulged out a portion of the old boiler-house wall no longer used, showered the office of the chief engineer with glass and covered a rotary converter with fragments. Windows were destroyed at the main office of the company 600 ft. up the street.

SERVICE UNINTERRUPTED BY EXPLOSION

The solid construction of the boiler house and switch house completely safeguarded the employees on duty, and the service was not interrupted by the opening of a single circuit breaker. Many of the principal lines of the underground service pass the gas company's plant. The mechanical shock of the explosion caused a slight movement of recording-instrument needles in the switch house. The turbo-generators in operation showed no sign of bearing temperature rise when observed closely for eight minutes after the disaster. McClintock & Craig, Springfield, designers of the boiler house, made an immediate inspection of the plant after the explosion and reported no structural damage to either building or stacks. The switch house was designed by Stone & Webster, Boston, and went through the test equally well.



EXPLOSION OF NEARBY GAS TANK "SCARCELY TOUCHED" SPRINGFIELD POWER HOUSE

Commonwealth Edison Plan

Samuel Insull Tells of Power House Soon to Be Erected on the Drainage Canal

TRUE selling engineering plus true distribution engineering was declared by Samuel Insull, in the course of an address made at Chicago before the Western Society of Engineers on Thursday evening of last week, to be the basic reason for the growth of the Commonwealth Edison Company. Mr. Insull's address dealt with central-station development in Chicago from 1892 to 1922 and thereafter. After giving a historical account of the building and growth of the company's earlier stations, he came to the Calumet plant, started in 1920, which by the end of 1923 will have a rating of 200,000 kw. The growth in demand has been so great, however, that the company is now compelled to build on an even larger basis. The new plant to be erected at Crawford Avenue on the Drainage Canal will develop at least 400,000 kw., although the possibilities are that the final capacity will be 600,000 kw. The first two units will have a rating between 90,000 kw. and 95,000 kw., operating at a steam pressure of about 600 lb. The first unit is to be purchased from Charles Parsons of England, while the second will be a Westinghouse unit.

EFFICIENCY OF CALUMET PLANT

Referring to the increased efficiency and fuel economy obtained in the Calumet plant, which operates on 1.8 lb. per kilowatt-hour as compared with the old Adams Street plant, which required 12 lb. of coal for one kilowatt-hour, Mr. Insull declared that if economy had not been improved in the last thirty years, the annual consumption of the Commonwealth Edison Company would now be 15,000,000 tons to 18,000,000 tons of coal instead of the present consumption of 2,225,000 tons to 2,500,000 tons. This improvement has not been due merely to the increase in steam pressure but has been assisted by the use of condensers. With 400 tons to 450 tons of water pumped through the condensers for every ton of coal burned in the furnaces, the Commonwealth Edison Company pumps more water than the city of Chicago uses for all other purposes.

Estimates on the construction of a transmission system from Waukegan down to the Indiana line involve two 132,000-volt transmission lines with a capacity of 75,000 kw. each, Mr. Insull informed his hearers. Although this transmission line would cost approximately $7,500,000, it would safeguard continuity of service and save a station investment of from $10,000,000 to $12,000,000.

Mr. Insull felt that the fundamental reason for the success of the company was selling large volumes of energy. By distributing 50 per cent more energy and receiving for it one-fifth less money the company was able to make more profit on the dollar invested, he contended, than has been the case with any other large electric light and power company elsewhere in the world.

In closing the speaker paid a tribute to Frederick Sargent, who, he said, had, as a designing engineer, contributed more than any other man toward the development of central stations.

Empire State Meter Section Meets at Syracuse

The recent annual meeting of the electric meter section of the Empire State Gas and Electric Association, held at Syracuse, brought out papers on demand-meter maintenance, by E. A. Le Fever, Buffalo General Electric Company; demand rates, by W. M. Carpenter; changing distribution from two-phase to three-phase, four-wire, by W. S. Davis, Public Service Corporation of New Jersey; effect of phase angle and power factor on polyphase meters, by J. B. Gibbs, Westinghouse Electric & Manufacturing Company; potentiometers, by I. Melville Stein, Leeds & Northrup Company; meter maintenance, by C. L. Casler, Syracuse Lighting Company; measurement of energy, by F. C. Holtz, Sangamo Electric Manufacturing Company, and jewels and pivots, by B. W. St. Clair, General Electric Company.

Mr. Le Fever said that in some cases 50 per cent of the revenue of electric companies is based on the demand element in rates. He emphasized the importance of the proper location of demand meters and of the regular and thorough cleaning of meter clocks. Mr. Carpenter said that, even ignoring the element of power factor, it is possible to obtain only an approximation of true electrical demand with the instruments now used. Mr. Davis outlined ways and means for changing over distribution, using meters already in stock and with a minimum of expense for the purchase of new transformers.

Mr. Le Fever was elected chairman of the section for the ensuing year.

All Ready for Institute's Midwinter Convention

All preparations for the midwinter convention of the American Institute of Electrical Engineers, to be held in the Engineering Societies Building, New York, from Wednesday to Friday of next week, are complete. The only change from the program as printed in the ELECTRICAL WORLD for Jan. 20, page 180, is that there will be parallel technical sessions on Thursday morning, three of the papers scheduled for the afternoon being transferred to the morning session. At noon on Thursday the delegates will visit the building of the McGraw-Hill Company as the guests of the publishing firm.

A Million Kilovolt-Amperes in Big Units

Large Turbo-Generators Under Order with Westinghouse and General Electric Reach This Rating—Smaller Units and Those to Be Built by Other Firms Will Double Total

THE healthy state of the electrical industry cannot be shown more vividly than by the news that two manufacturing companies alone have under contract 1,139,500 kva. in turbo-generator units of 25,000 kva. rating and larger. Add to these units the production under way by other companies as well as the smaller units being built by the two companies referred to and an estimate of about two million kilovolt-amperes is obtained, representing the power equipment now being made under order from central-station companies.

In order to show the type of unit and the nation-wide extent of the buying, the tabulation given below should be interesting.

The Detroit Edison turbines are for a new station at Trenton Channel; the American Gas & Electric equipment is for a new station at Philo, Ohio; the General Electric turbines for Cleveland, Philadelphia and Chicago will be added to existing stations, as will the equipment ordered by the New York Edison Company. The turbines the Westinghouse company is building for the Commonwealth Edison are for its Calumet station and the coming station on Crawford Avenue, the Brooklyn equipment will go in its new Hudson Street station and the Public Service Production Company's generator will be installed at Jersey City.

LARGE TURBO-GENERATOR UNITS NOW CONTRACTED FOR

Company Ordering	No. of Units	Rating Each, Kva.
General Electric Company		
Detroit Edison	Three	50,000
American Gas & Electric	Four	35,000
Cleveland Electric Illuminating	One	30,000
Public Service of Northern Illinois	One	30,000
Minneapolis General Electric	One	30,000
Commonwealth Edison	One	30,000
Philadelphia Electric	Two	30,000
New York Edison	One	35,000
New York Edison	One*	35,000
Westinghouse Electric & Manufacturing Company		
Commonwealth Edison	One	50,000
Commonwealth Edison	One	37,000
Brooklyn Edison	One	62,500
Connecticut Light & Power	Three	25,000
Middle West Utilities	Two	25,000
Indiana Public Service	Two	25,000
Counties Gas & Electric†	One	25,000
Denver Gas & Electric	One	25,000
Moline & Rock Island Manufacturing Co.	One	25,000
West Penn Power	Two	30,000
Public Service Production (N. J.)	One	25,000
Luzerne County (Pa.) Gas & Electric	One	25,000
Lorain County (Ohio) Gas & Electric	One	25,000
Toledo Edison	One	37,500
Metropolitan Edison‡	One	37,500
Pennsylvania Railroad‖	One	25,000

*Frequency changer. †Philadelphia.
‡Reading, Pa. ‖For Long Island City.

From Mexico to Puget Sound

Closing of Two Gaps, Which Is Now Under Way, Will Provide an 1,800-Mile Interconnected Power System on the Pacific Coast, with a Generating Capacity of 1,640,000 Kw.

COULD a kilowatt be isolated at Yuma, Ariz., equipped for travel with a through ticket and a clear line, it would be possible to transfer it to Albany, Ore., over approximately 1,200 miles of copper, composing the backbone of a superpower system whose annual kilowatt-hour output is almost one-tenth the total annual consumption of electrical energy in the United States and whose network of transmission and distribution lines exceeds half the total railway mileage of America. While the East has been talking and agitating for a superpower system in the Boston-Washington district, Western public service companies have gone quietly about the business of interlinking their lines until at the present time there has been built up an interconnected network which covers three states and which within the next eighteen months will cover the entire Pacific Coast, from the Mexican border to Puget Sound.

THE REMAINING GAPS

The Pacific Coast Interconnected Transmission System at the present time comprises all of the major California power companies and two of the important Oregon utilities. Plans are now under way for the closing of the two remaining gaps in the Pacific Northwest, and when this is done there will then exist a superpower system whose main trunk will be approximately 1,800 miles long, whose generating capacity, both steam and hydro-electric, will be nearly 1,700,000 kw., and whose annual output will be close to 6,000,000,000 kw.-hr. Were this system to be transposed to the Atlantic seaboard, it would serve a territory extending from Quebec, Canada, to Charleston, N. C.

The lines of the system cross barren deserts, traverse fertile valleys and wooded hills, and finally climb through a pass in the Sierras to carry power to the Nevada mines. They are fed by steam plants fired with oil and natural gas and by hydro-electric plants whose generators are turned by waters from the eternal Sierra snowbanks or from the never-diminishing springs of the Pit River. Even the vagaries of nature are overcome, for in years when rainfall is light in the south and water scarce power can be sent from the north to make up the resulting shortage.

Some idea of the immensity of the present interconnected system existing on the Pacific Coast can be gained from the figures it involves. The present system includes the lines of eleven major companies and one municipality, involving a total steam generating capacity of 402,150 kw. and a hydro-electric generating capacity of 839,990 kw. The annual output of the system for the year ended Dec. 1, 1922, was 4,330,640,821 kw.-hr.

The two gaps which must be closed before the lines of the Pacific Northwest will be tied in with those of California are shown in the map. There is a transmission line at the present time between Springfield, Ore., and Portland, which is the property of the Oregon Electric Company and which operates at 33 cycles. The lines of the Mountain States Power Company and the California Oregon Power Company, which are joined at Springfield, both operate on 60 cycles. The Oregon Electric Railway Company is at the present time installing twelve automatic substations which will operate on 60 cycles, and upon the completion of this installation it is planned to change over the lines to 60 cycles and interconnect with the California Oregon Power Company at Springfield. The Portland Railway, Light & Power Company supplies the railway transmission line, and when this connection is made the interconnected system will extend to The Dalles, Ore., over the system of the Pacific Power & Light Company, which is tied in with that of the Portland Railway, Light & Power Company.

The second gap exists between two of the divisions of the Pacific Power & Light Company. Surveys are being made for a line along the banks of the Columbia between The Dalles and Umatilla and officials of the company predict that the line will be completed within the next eighteen months. When these two gaps are closed there will be added to the interconnected system 99,815 kw. in steam generating capacity and 298,215 kw. in hydro-electric generating capacity.

Interconnection, then, as far as the Pacific Coast is concerned, is an accomplished fact. Quietly, without the blare of trumpets, there is being built up a superpower system which eclipses anything in the world—a system which will serve four states and a population of approximately 5,600,000.

Tidewater Power Company to Expand

The Tidewater Power Company of Wilmington, N. C., controlled by A. E. Fitkin & Company of New York, is to proceed at once with the construction of a transmission line from Wilmington to Warsaw and Clinton. The line will be about 68 miles in length and cost approximately $130,000. Cotton mills and other manufacturing plants will be served, and it is expected that a number of towns between Wilmington and the two places named will also be supplied with light and power.

A. M. E. S. Schedules Its March Meetings

The following schedule of section meetings has been drawn up by the Associated Manufacturers of Electrical Supplies for the week beginning March 5. All meetings will be held in the association offices, 30 East Forty-second Street, New York.

MONDAY, MARCH 5

1:30 p.m.: General standards committee. 7:45 p.m.: Committee on section activities.

TUESDAY, MARCH 6

10 a.m.: Snap switch section, molded or formed insulation section, laminated phenolic condensation products section. 2 p.m.: Line material section, lamp receptacle and socket section, air circuit-breaker section. 4 p.m.: Attachment plug section.

WEDNESDAY, MARCH 7

10 a.m.: Fuse section, fan motor section, carbon section, rigid conduit section. 11:30 a.m.: Non-metallic conduit section. 2 p.m.: Armored conductor and metallic flexible conductor section; knife switch section, industrial lighting section. 4 p.m.: Metal molding section.

THURSDAY, MARCH 8

10 a.m.: Panelboard and switchboard section, outlet box section, signaling apparatus section.

FRIDAY, MARCH 9

10 a.m.: Heating appliance section. 2 p.m.: Meeting of board of governors.

Federal Power Commission Activities

The Tennessee Hydro-Electric Company of Knoxville has applied to the Federal Power Commission for a preliminary permit for projects on the Clinch and Powell Rivers in Tennessee and Virginia. These streams are tributaries of the Tennessee. The ultimate installation of 390,000 hp. is contemplated. The company draws its financial support from New York and Pittsburgh interests. J. R. Paul of Pittsburgh is president. The same interests previously applied for a preliminary permit covering three projects on the Holston River.

The Virginia Power Company, a going concern in West Virginia, has applied for a preliminary permit for a large development on New River, 5 miles above Hinton. The power will be used to extend the present system of the company, which is furnishing power to coal mines, public utilities and manufacturing plants in that region.

The Louisville Gas & Electric Company has declared its intention to apply to the commission for a preliminary permit covering projects on the Green and Cumberland Rivers in Kentucky.

The Susquehanna Power Company of New York recently filed a declaration of intention covering the construction of a dam 70 ft. high in the Susquehanna River at Conowingo, Md. The Chief of Engineers of the army has ruled that the Susquehanna at that point is a navigable stream, and it is probable that the commission will find that the project comes within federal jurisdiction.

Complaints from public utility companies concerning the delay of municipalities in exercising water-power rights probably will result in a formal opinion being rendered by the chief counsel of the commission as to whether or not cities may be granted these rights when no bond issue has been voted, no state charter issued and no approval from the voters obtained.

Forest Service and Alaskan Development

Hutton, McNear & Dougherty of San Francisco are pressing the Federal Power Commission for a license to cover the power project on Cascade Creek, in the Tongass National Forest, in Alaska. They hold a preliminary permit covering this project, which is among the best power sites in Alaska, and are anxious to begin work in the spring.

The Forest Service has taken the position that the power rights should not be granted until the timber has been sold. Before bids can be asked for the timber, it must be cruised, or inspected, and the proposed sale advertised. These preliminaries will require until July 15 at least. Since the Forest Service is not willing to make an exception in this case, the development may be delayed a year. For the past two seasons the Forest Service has been reconnoitering the possible power sites in the national forests of Alaska, and it is cruising the timber in those areas where development is likely so as to prevent these delays. Every effort is being made by both the Power Commission and the Forest Service to co-ordinate their work, but in this particular case it seems almost certain that the applicant will have to wait.

Iowa Engineering Society Discusses Furnace Design

Taking exception to the statement that a furnace designed to burn Iowa coal will not successfully handle Virginia or Kentucky coal—an assertion made by J. M. Drabelle in his paper before the mechanical and electrical section of the Iowa Engineering Society on "Arch and Furnace Design for Iowa Fuels"—A. T. Luce of the Des Moines city waterworks called attention to the fact that a furnace designed for Iowa coal is larger than necessary for fuel from the other states mentioned and that the tests made by the Bureau of Mines show that too large a furnace is not a detriment but merely an added expense. Mr. Luce indicated that the real trouble in using the high-heat and low-ash-value coals lies with the natural-draft chain-grate stoker, owing to the lack of ash to protect the excess grate area. He said that this difficulty is encountered with the Illinois coal to a less extent. He also explained that it has been eliminated in the forced-draft-natural-draft chain-grate stoker, which is arranged so that the grate area can be reduced and the air regulated by forced-draft equipment. In an installation under his own observation during the coal shortage it had been possible to burn successfully eastern Kentucky semi-bituminous, Colorado, Illinois and Kansas coals and Iowa "bug-dust," with slight difficulty in changing from one to the other. The heat value and ash range in these fuels was from 13,000 B.t.u. with 7.6 per cent ash to 6,430 B.t.u. with 33.4 per cent ash. Mr. Luce also declared that the chain-grate type of stoker is most effective and satisfactory with the Iowa fuels, although there are several other types working successfully. The large percentage of ash requiring constant dumping makes other types of stokers the exception rather than the rule. The low fusing point of the ash and the high sulphur content lead to clinker troubles when the fuel is agitated.

B. P. Fleming asserted that 50.7 per cent of the fuel of the country is burned in small plants that cannot afford to make changes in furnace design. He thought that the best means of increasing efficiency in these cases is the education of the firemen.

T. A. Marsh of the Green Engineering Company also called attention to the importance of the firemen as a factor in the efficiency of the boiler plant and discussed the tempering of fuel before firing in relation to combustion.

A. I. E. E. Committee on Ship Electricians' Status

The marine committee of the American Institute of Electrical Engineers and the committee on marine electrical engineering practices of the American Engineering Standards Committee have sent a letter to the board of supervising inspectors of the Steamboat Inspection Service dealing with the status of the men aboard ship whose duty it is to maintain the electrical equipment—a matter that is becoming of increasing importance with the increase of electric propulsion. If competent men are to be obtained for this work, it is evident that they must rank as ship's officers and not simply as working electricians.

To meet this situation the committees suggest that the board establish a series of examinations leading to various electrical certificates that may be obtained by steam engineers in addition to their regular licenses, and another set of examinations leading to electrical certificates for the engineering officers of a ship fully equipped with electric power. The committees recommend further that on all ships carrying electrical officers there shall be carried in addition one or more electricians who shall have a rank comparable to that of petty officer or that of the foreman in land practice. Detailed recommendations are attached to the committee's letter

Two Big Issues in One Day

On Thursday of last week, Feb. 1, the Alabama Power Company placed upon the market $4,700,000 in first mortgage lien and refunding 5 per cent gold bonds, due 1951, at 89½ and interest, to yield 5¾ per cent. The bonds are callable at 105 and interest, to and including June 1, 1932, and thereafter at a premium reducing one-quarter of 1 per cent per annum.

On the same day the Connecticut Light & Power Company offered a new issue of $4,500,000 in cumulative 7 per cent preferred stock at $100 per share, yielding 7 per cent.

America's Part in London's Power Congress Unsettled

American participation in the power congress to be held in London in May of next year was to be discussed informally by representatives of the interests principally concerned at a meeting held in New York on Feb. 8. O. C. Merrill, the executive secretary of the Federal Power Commission, had asked a small group to gather on that date so that some idea might be gained as to the feeling in this country concerning American participation. Some objection has been voiced to this country's having any part in congress unless the exposition of electrical machinery and electrical products is opened to American manufacturers. Otherwise, these objectors contend, the

United States will contribute importantly to the success of the congress and will help greatly in attracting attendance at an exposition where the exhibits will be confined to articles of British manufacture. At a preliminary conference held in Washington, Jan. 30, it was suggested that the Federated American Engineering Societies should take the matter up with the promoters of the congress to ascertain the exact facts.

New Mexico Electrical Men Adopt Program

For its ninth annual convention, to be held at Albuquerque on Feb. 12 and 13, the New Mexico Electrical Association has adopted the following program:

MONDAY, FEB. 12

Afternoon.—"Modern Highway Lighting," B. C. J. Wheatlake, General Electric Company, Denver; "The Power-Factor Problem," N. R. Stansel, Southwest General Electric Company, El Paso; "Utility's Place in the Industrial Field," J. E. Moorhead, Mountain States Telephone & Telegraph Company, Denver; "Method of Practical Field Testing of Transformer Loads With or Without Graphic Instruments," E. D. Stewart, Westinghouse Electric & Manufacturing Company, El Paso; "Electrical Homes," C. A. Winder, Southwest General Electric Company, El Paso; open discussion by members on general matters concerning public utility problems.

Evening.—Entertainment.

TUESDAY, FEB. 13

Morning.—"Recent Scientific Work on Coal," Prof. John D. Clark, State University of New Mexico; "The Public's Response," George E. Lewis, executive manager Rocky Mountain Committee on Public Utility Information; "Power-Plant Construction," George J. Gauthier, engineer Federal Light & Traction Company, New York; "Automatic and Remote Control of Induction Motor," Prof. R. W. Goddard, State College of New Mexico; moving pictures furnished by E. H. Waddington, Western Electric Company, St. Louis.

Afternoon.—"Activities of Rocky Mountain Section, N. E. L. A.," J. F. Dostal, president Rocky Mountain Geographic Division, N. E. L. A.; "Manufacture and Operation of Porcelain Insulators," R. H. Marvin, chief engineer R. Thomas & Son, East Liverpool, Ohio; "Electrical Contracting," M. Nash, Albuquerque; election of officers.

Evening.—Annual banquet.

Denver Meet a Big Success

Commercial Section N. E. L. A. Men Flock to Bureau and Committee Sessions in Mid-Continent

GREAT satisfaction with the three-day meeting of the Commercial Section of the National Electric Light Association held in Denver from Jan. 24 to Jan. 26 was expressed by the chairman of the section, Oliver R. Hogue, who said the sessions, which brought together at a point in mid-continent commercial men from all parts of the country, were the most important yet held. The attendance of 250 delegates and guests made the meetings and banquet seem more like those of a convention than like committee proceedings. An account of the opening day was contained in the ELECTRICAL WORLD for Jan. 27, page 236.

More than one hundred were in attendance at the meeting of the Merchandise Sales Bureau. The discussion centered around the possibilities of the electric range and methods of promoting electric range load. The Lighting Sales Bureau announced plans to work along two important lines during 1923—the development of the residence load and the cultivation of the store-lighting load. It was pointed out that 58 per cent of the revenue of central-station companies comes from these sources and that it is possible with benefit to the consumer to double the present lighting intensities in the home and in the store.

The Power Sales Bureau paid special attention to the problems of Western central-station companies and is to devote effort to new types of drive and control which will increase production and lower operating costs. Western men asserted that there exists a large field in the further electrification of the lumber industry and the oil wells of California. There is now 50,000 hp. in motors in use in the oil fields of that state on the lines of one central station alone. The problem of applying electric drive to the pumping of wells has been comparatively easy, but the application to drilling has not been so simple, because manufacturers do not yet produce the type of equipment necessary. The industrial heating schools started last year will be continued. It is the plan of the Power Sales Bureau to establish such schools next year in various important centers of industry in the West, working through the geographic divisions of the N. E. L. A. The manufacturers have recognized the necessity of having trained salesmen in the field and are planning to send out specialists. During 1923 the bureau will take up the study of the operating economies of uniflow and Diesel engines and will probably undertake a survey to determine the average power factor of induction motors in industrial plants in order to ascertain to what extent overmotoring is responsible for poor power factor.

VEHICLE BUREAU NAME CHANGED

At the meeting of the Electric Vehicle Bureau the dominant feeling was that the electric truck is now "coming into its own" as a factor in city transportation and rapidly developing into an important source of revenue for the power companies. A motion was passed at the meeting of the executive committee to change the name of the bureau to "Electric Truck and Car Bureau."

The meeting of the executive committee of the section, held on the last day, was devoted to reports from the chairmen of the various bureaus and a discussion of plans for the national convention to be held in New York in June.

The hospitality of the electrical interests of Denver was profuse and will long be remembered by the visiting delegates.

GROUPS OF DELEGATES TO N. E. L. A. COMMERCIAL SECTION MEETINGS IN DENVER

Standing, left to right—C. R. Skinner, New York; N. T. Wilson, Keokuk, Iowa; Vernon Tallman, Boston; H. S. Meese, Philadelphia; E. Praget, Schenectady, N. Y.; R. M. Bleak, Salt Lake City; R. P. Sanborn, Orange, N. J.; M. C. Morrow, New York; C. O. Dunten, Springfield, Ill.; W. L. Goodwin, New York. Sitting—J. R. Coxe, New York; F. R. Jenkins, Chicago; C. K. Nichols, New York; G. E. Miller, Cleveland; A. K. Baylor, New York; Samuel Adams Chase, New York.

Front row, seated, left to right—Harold Wright, Chicago; R. S. Hale, Boston; Oliver Hogue, Chicago; A. W. Childs, Los Angeles. Standing, left to right, L. C. Spake, Chicago; E. R. Jacobs, Chicago; C. E. Greenwood, Boston; C. A. Cummings, Chicago; James Kirk, Chicago; E. A. Edkins, Chicago; G. B. Regar, Philadelphia; A. M. Frost, Fresno, Cal.; W. E. Clement, New Orleans; D. C. Ray, H. E. Sandoval and Walter C. Heston, all of San Francisco, Cal.

Illinois Utilities' Chicago Convention

The tentative program of the joint convention of the three Illinois utility associations to be held in the Hotel Sherman, Chicago, March 14 and 15 has been announced. The morning sessions will be joint meetings of the Illinois State Electric Association, the Illinois Gas Association and the Illinois Electric Railways Association. The annual banquet is to be held on the evening of March 14.

The tentative afternoon program for the electric association is as follows: "Survey of Appliances and Their Use in Residences in Chicago," H. B. Gear, Commonwealth Edison Company; "Thirty-Thousand-Watt High-Tension Transformer," representative of the General Electric Company; "Unattended Distributing Substations of the Commonwealth Edison Company," H. E. Wulfing, Commonwealth Edison Company; "Alternating-Current and Direct-Current-Controlled Automatic Feeder Substations," F. E. Goodnow, Public Service Company of Northern Illinois; reports of the Accounting Section of the Great Lakes Division, N. E. L. A., the committee on uniform classification of accounts and the committee on customers' records and billing; "Correct Meter Installation and the Use of Protective Devices Against Thieving," R. D. Hart, Central Illinois Light Company; symposium on merchandising: Domestic appliances, by a representative of the United Appliance Company; commercial appliances, convenience outlets and electrical homes, by E. W. Lloyd, Commonwealth Edison Company.

Co-operation of Utility May End Holyoke Dispute

Controversy between the Holyoke (Mass.) Water Power Company and the Gas and Electric Department of that city, arising from what city officials construed as unfair competition with the city in supplying electrical energy, now appears to be approaching a settlement. In an acute fuel shortage which the city plant has lately experienced the company offered to reestablish connections between local plants and to furnish the city with energy to meet the emergency. This offer was accepted and an arrangement made for the purchase of 1,500 hp. daily from the company, to effect a saving of a carload of coal daily to the city plant. The immediate occasion of the trouble between the utility and the city was the action of local silk manufacturers in contracting with the company for a large part of their electrical energy, instead of continuing to take it entirely from the city, and the Holyoke Chamber of Commerce appointed a committee to study the merits of the controversy and seek a basis of peace.

This committee has submitted a report in which it approves of the expansion of the company, operating within its franchise rights, and suggests that it ought not to be hampered in furnishing electrical energy to any of its hydraulic power customers. The committee recommends that the connection of the city department with the company's lines be made permanent and that the city's service be developed to the limit of the possibilities of its present location. The report views dubiously the building of a new power plant by the city at a new location, believing that the larger opportunities which are being opened to New England in electric power supply can be utilized to far better advantage by the Holyoke Water Power Company than by the municipality. As the company has extensive resources in surplus hydraulic power the committee recommends that these be developed for the benefit of the community.

Industrial Heating School to Be Held in Spring

All central-station commercial managers have received a letter from Wirt S. Scott, chairman Industrial Heating Division of the National Electric Light Association, with reference to the conduct early this spring of another central-station school of industrial heating for power engineers like the one which proved so successful last year. The Westinghouse Electric & Manufacturing Company and the General Electric Company have agreed to undertake this work again for one class each, provided that the class is sufficiently large to warrant the expense involved. The course will last two weeks. As outlined by the N. E. L. A. division, it includes lecture courses on industrial heating and high-temperature electric furnaces, a combined shop and lecture course and a shop course. The Westinghouse school will start at Mansfield, Ohio, be continued at Pittsburgh and concluded at Newark, N. J. The General Electric school will start at Schenectady, N. Y., and be concluded at Pittsfield, Mass.

This action by the Industrial Heating Division was the most important outcome of its meeting on Jan. 25, wher members from East Pittsburgh, Schenectady, Waterbury, Cleveland and Youngstown were present.

E. H. Sniffin Talks to Western Massachusetts Engineers

E. H. Sniffin, manager of the power department of the Westinghouse Electric & Manufacturing Company, addressed the Springfield (Mass.) branch of the American Institute of Electrical Engineers Jan. 16 on "The Engineer." In the course of his remarks he said: "We are wasting more than half the 300,000,000 tons of coal we use in a year for power purposes. Many plants consuming between five and ten pounds of coal per kilowatt-hour should do the same amount of work on two pounds. Forty millions of water horsepower are yearly going to waste in this country, or double what we are now using. The problem is to utilize this power in greater volume and thus effect a vast saving in coal and the expense of hauling it from the mines. Last year the purchases in this country of steam-turbine capacity in sizes of 500 kw. and larger amounted to 10,000 hp. a day. The average size of unit was 6,500 kw. and the largest was 50,000 kw. The new electric power facilities that must be created in this country in less than ten years will exceed in extent all the facilities that exist today and which have been forty years in the making."

Brief News Notes

Cupples Station Company May Expand.—St. Louis papers report the purchase of a 14-acre tract in North St. Louis, near the Mississippi River, by the Light & Development Company as a tentative site for a large supplementary power house for the Cupples Station Light, Heat & Power Company.

New York Interests Acquire Keystone Power Corporation.—The American Water Works & Electric Company, New York, has acquired control of the Keystone Power Corporation, which will be managed by the West Penn Power Company. The Keystone Power Corporation supplies Kane, James City, Mount Jewett, Hazlehurst, Smethport, Ridgway, Johnsonburg, St. Marys and Kersey, together with smaller places in western Pennsylvania.

New Hood River Plant.—The new 10,000-hp. hydro-electric plant of the Pacific Power & Light Company on the Hood River, near the town of the same name in Oregon, will be completed and placed in operation by March, according to the present estimate of the company. This plant, which will cost approximately $1,250,000, will be tied in with the Condit hydro-electric plant of the Northwestern Electric Company on the opposite side of the Columbia River.

Quick Recovery from Substation Fire.—Approximately seven and one-half days after the recent fire which caused damage to the amount of $50,000 to the Eagle Rock switching station of the Southern California Edison Company all impediments to the distribution of power were removed and the system was on a physically normal basis. Men of the Edison company's engineering and repair departments worked day and night to bring this about.

Genesee Light & Power Absorbs Le Roy Company.—All the outstanding stock of the Le Roy (N. Y.) Hydraulic Electric Company has been purchased by the Genesee Light & Power Company of Batavia, N. Y., and the latter company is now operating the Le Roy plant. As soon as a transmission line from Batavia to Le Roy can be built the operation of the Le Roy steam plant will be discontinued and the city will be served with Niagara power from Batavia.

Municipality to Take Over Central-Station Plant.—The city of Rice Lake, Wis., is to take over the local light and power plant belonging to the Wisconsin-Minnesota Light & Power Company. A price of $233,000 has been set on this plant by the Wisconsin Railroad Commission. This action is in accordance with a popular vote taken in August, 1920, when a majority of more than three to one favored the proposal. The plant has been furnishing electric light and power for thirty years.

North Penn Merger.—The Blossburg (Pa.) Electric Light & Power Company and the Mansfield (Pa.) Electric Company, together with seventeen other small electric service companies, have been merged into the North Penn Power Company, to be operated and managed by Gannett, Seelye & Fleming, consulting engineers, Harrisburg. It is proposed to develop this territory extensively. The fiscal agents for the North Penn Power Company are Jay N. Schroeder & Company, who have been in the investment banking business in Lancaster for eighteen years.

Eastern Connecticut Buys Danielson Property.—Papers have been signed looking toward the acquisition by the Eastern Connecticut Power Company of Norwich of the People's Light & Power Company and the affiliated Danielson & Plainfield Gas & Electric Company of Danielson. Under the transfer of ownership the Eastern Connecticut company, which operates interconnected steam and hydro-electric plants and which is tied in with the system of the New England Power Company, will distribute energy in the towns of Killingly, Brooklyn, Plainfield, Canterbury, Griswold and Jewett City.

Buffalo Claims Largest Outdoor Station.—Terminal "C" of the Buffalo General Electric Company, said to be the largest outdoor station of its kind in the United States, was put into operation at Buffalo on Jan. 28 to furnish power generated by the Niagara Falls Power Company at Niagara Falls. The ultimate capacity of Terminal "C" will be 175,000 hp. Transmission is at 66,000 volts stepped down to 22,000 volts for distribution to substations. The cost of the new station was more than $500,000. The same company will complete a new service building at Niagara and Front Streets about April 1.

Good Progress on Devon Plant.—Construction of the new $3,500,000 power plant at Devon, Conn., for the Connecticut Light & Power Company, Waterbury, has started. The site is about three miles above the mouth of the Housatonic River and is convenient for the supply of energy throughout the Housatonic and Naugatuck valleys. Three units, with a total capacity of 75,000 kw., are first planned, and when completed the plant will have six units with a total capacity of 150,000 kw. The foundations are nearly completed. The station building proper will be of steel and hollow-tile construction and will have five 300-ft. steel stacks, each 16 ft. in diameter. The "U. G. I." interests of Philadelphia are in charge of the work.

Bill to Promote Water-Power Development in New Hampshire.—A bill introduced into the New Hampshire Legislature by former Governor Bass of that state provides for the selection of a site where a substantial amount of water can be stored at a moderate cost and for negotiations with owners of water-power privileges on the stream below the proposed storage reservoir with a view to making contract with such plants for the additional water to be thus provided. The plan aims to provide additional power at every plant now operating below the site of the proposed reservoir at a minimum cost and without adding anything to the public charges. Those who use the water will, by the terms of the bill, pay for the interest on the cost of development, maintenance and operation and in addition they will pay off the principal within a period of fifty years. At the end of that time, the reservoir and water rights will be owned by the state free and clear.

Associations and Societies

Sacramento Valley Electric Society.—An association under this name has been organized at Sacramento, Cal., with more than sixty members.

Wisconsin Engineering Society.—Plans are now being made for the annual convention of the Wisconsin Engineering Society, to be held in Madison, Feb. 22-24.

Pennsylvania State Association of Electrical Contractors and Dealers.—The eleventh annual meeting of this association will be held in Lancaster, Pa., on Wednesday, Feb. 28. Among the chief features will be an "electric open forum" designed to bring contractor-dealers into consultation with representatives of other branches of the industry.

Supply Jobbers to Meet in Chicago.—The regular quarterly meeting of the Central Division of the Electrical Supply Jobbers' Association will be held at the Sherman House, Chicago, on Tuesday and Wednesday next week, Feb. 13 and 14. The two morning sessions will be open, while the afternoon session on Tuesday will be devoted to an executive meeting.

Electric Power Club.—The next annual meeting of the Electric Power Club will be held on June 11 to 14 at the Homestead, Hot Springs, Va., where this association was organized in 1908. It is expected that important standardization of electric power apparatus will be effected at the coming meeting, because the new edition of the Electric Power Club handbook will be published soon thereafter and the different sections of the club are eager to get their work into this book.

New York Section, I. E. S.—On Thursday, Feb. 15, Dr. Clayton H. Sharp, will talk on "Observations in Europe" and F. V. Magalhaes will comment on the international standardization of Edison lamp bases and sockets before this section of the Illuminating Engineering Society in the auditorium of the Consolidated Gas Building. Dr. Sharp and Mr. Magalhaes were delegates to the International Electrotechnical Commission meeting at Geneva.

Gilchrist to Address New England Merchandisers.—John F. Gilchrist, vice-president Commonwealth Edison Company, Chicago, is to address the first luncheon meeting of the Merchandising Bureau of the New England N. E. L. A. Commercial Section at the Boston City Club, Feb. 14, at 12:30 p.m. His subject will be "Merchandising and Merchandising Conditions." The bureau will hold three or four other luncheon meetings before midsummer, the schedule calling for an address at the Bond Hotel, Hartford, March 14, by A. G. Kimball, president Landers, Frary & Clark, and one by H. A. Lewis of *Electrical Merchandising*, on "Compensation of Salesmen," at the Congress Square Hotel, Portland, Me., May 16.

Coming Meetings of Electrical and Other Technical Societies

[A complete directory of electrical associations is published in the first issue of each volume. See Jan. 6 issue, page 78, for latest list.]

New Mexico Electrical Association—Albuquerque, Feb. 12-13. C. E. Twogood, Albuquerque, N. M.

Electrical Supply Jobbers' Association—Central Division, Chicago, Feb. 13-14; Atlantic Division, New York, Feb. 14; executive committee and general meeting, Hot Springs, Va., May 21-25. Franklin Overbagh, 411 S. Clinton St., Chicago.

American Institute of Electrical Engineers—New York, Feb. 14-16. F. L. Hutchinson, 33 West 39th St., New York.

American Electric Railway Association—Washington, D. C., Feb. 16. J. W. Welsh, 8 West 40th St., New York.

American Institute of Mining and Metallurgical Engineers—New York, Feb. 19-21.

Wisconsin Engineering Society—Feb. 22-24. L. S. Smith, College of Engineering, Madison.

American Physical Society—New York, Feb. 24; Washington, April 21. D. C. Miller, Case School of Applied Science, Cleveland.

Pennsylvania State Association of Electrical Contractors and Dealers—Lancaster, Feb. 28. M. G. Sellers, 1518 Sansom St., Philadelphia.

Oklahoma Utilities Association—Oklahoma City, March 12-14. O. D. Hall, 1106 First National Bank Bldg., Oklahoma City

Southwestern Division, N. E. L. A.—Oklahoma City, March 14-16. S. J. Ballinger, San Antonio Public Service Co., San Antonio, Tex.

Illinois State Electric Association—Chicago, March 14-15. R. V. Prather, 305 Mine Workers' Bldg., Springfield, Ill.

Wisconsin Utilities Association—Milwaukee, March 22-23. John N. Cadby, 445 Washington Bldg., Madison.

Tri-State Water and Light Association—Birmingham, April 17-20. W. F. Steiglitz, Columbia, S. C.

American Electrochemical Society—New York, May 3-5. Colin G. Fink, Columbia University, New York.

Southwestern Public Service Association—Fort Worth, Tex., May 15-17. E. N. Wills, 403 Slaughter Bldg., Dallas, Tex.

American Society of Mechanical Engineers—Montreal, May 28-31. C. W. Rice, 29 West 39th St., New York.

National Electric Light Association—New York, June 4-8. M. H. Aylesworth, 29 West 39th St., New York.

Electric Power Club—Hot Springs, Va., June 11-14. S. N. Clarkson, Kirby Bldg., Cleveland.

Pacific Coast Electrical Association—San Francisco, June 19-22. S. H. Taylor, 527 Rialto Bldg., San Francisco.

Recent Court Decisions

Rate-Fixing Procedure of New Jersey Commission.—Reversing on a writ of certiorari an order of the Board of Public Utility Commissioners of New Jersey (Hackensack Water Company vs. Commissioners), the Supreme Court of New Jersey held that the board must take the present value as the value of property devoted to public use and may not arbitrarily take the average for the two preceding years, notwithstanding the making of valuable improvements in the second of such years. Moreover, the board must take into consideration deficiencies in earnings accumulated during a series of years under and due to prior insufficient rates fixed by the board. (119 At. 84.)*

Contributory Negligence in Relation to Linemen.—In Elliott vs. Water, Light & Transit Company damages were sought for the death of a workman of little experience who was killed while engaged in stringing and connecting transmission wires in Keytesville, Mo., because the current was not cut off and some of the wires were uninsulated. The trial court refused to instruct the jury to render a verdict for the defendant on the ground of contributory negligence, and the jury found for the plaintiff. The Kansas City Court of Appeals has now reversed this finding and ordered a new trial, but on purely technical grounds connected with a defect in the original petition. (245 S. W. 568.)

Presumption Is That Franchise Rates Are Reasonable.—Although a city and a utility company are powerless to make an irrevocable contract as to rates, yet the rate specified in the franchise, in the absence of negative allegations, will be presumed to be a reasonable rate for the purpose of considering the sufficiency of a complaint on demurrer, and on a hearing of a motion for a temporary injunction a like force will be given to such specified rate, in the absence of affidavits tending to show that it is unreasonable. This was the finding of the Supreme Court of South Dakota in an action brought by the city of Mitchell against the Mitchell Power Company to prevent it charging a rate for gas in excess of the maximum franchise rate. (190 N. W. 1013.)

Employer Not Liable for Injury from Explosion of Electric Light Bulb.—Sustaining a non-suit in Russell vs. St. Louis & San Francisco Railway Company, the Springfield (Mo.) Court of Appeals found the company not liable for an injury to the eye of the defendant caused by the explosion of an electric light bulb from which he got light on his work. The doctrine of *res ipsa loquitur* (the thing speaks for itself) was held not to apply in the absence of allegations that employer manufactured and supplied its own electric light bulbs and the electricity to produce the light, or that an explosion would not have occurred without some negligence in the use of the bulb and electricity, or unless the construction of the bulb was faulty, since the court could not take judicial notice as a matter of common knowledge that an electric light bulb will not explode except as the result of negligence. (245 S. W. 590.)

Riparian Owners' Rights to Water Power.—In a suit brought by the Watervliet Hydraulic Company against the State of New York to obtain compensation for lands appropriated for Barge Canal purposes and damages for such appropriation the Court of Claims of New York found that a riparian owner whose lands border on a stream the bed of which is owned by the state has no right to use the water power of the river at that point, where the only practicable method for using that power requires the construction of a dike or dam extending into the river on the state-owned lands. The owner of tracts of land on opposite sides of a river the bed of which was owned by the state, who had for many years maintained a dam across the river between those tracts without objection by the state, is not a mere trespasser, but it must be presumed the state acquiesced in the maintenance of the dam, so that the riparian owner was a licensee, and where the state, instead of requiring the licensee to remove the dam, elected to appropriate it, it must pay the owner the value of the dam, considering the fact that the owner has no right to maintain it if the state should require its removal. (197 N. Y. S. 348.)

Property Owner Maintaining Electric Conductor Near Sidewalk Liable for Injury.—Ruoceo vs. United Advertising Corporation and United Illuminating Company was a suit to recover damages for the death of a passing pedestrian who was said to have reached over and touched a chain hanging close to the inside of the open door of the first-named defendant's garage, this chain, it was alleged, having become charged with electricity owing to the failure of both defendants to install and maintain properly the wiring and electric apparatus used in the garage. The defendants claimed that the victim was a trespasser as the chain was beyond the sidewalk and on private property, and this contention was sustained by the trial court. The Supreme Court of Connecticut has reversed the judgment and remanded the case, asserting that an owner of property abutting on a highway rests under an obligation to use reasonable care to keep his premises in such condition as not to endanger travelers in their lawful use of the highway, and that if he fails to do so, and thereby renders the highway unsafe for travel, he makes himself liable, even though the consequent injury is received upon his own land and not on the highway. (119 At. 48.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Proper Expenditure for Extension.—In adjusting a complaint brought against the Plaistow Electric Light & Power Company the New Hampshire Public Service Commission held that such a company should expend in making an extension an amount which would be equivalent to the total gross income from the business of the new territory for a period of three years in cases where the increase in business is doubtful and the cost of installation substantial. The estimated cost of construction, the commission said, should contemplate a free right-of-way with no expense for tree cutting or other work of a similar kind necessary in making the extension.

Using Prospective Customers' Labor in Constructing Line.—Passing upon an application for electric service made by would-be customers of the Utah Power & Light Company living nearly a mile from its lines, the Utah Public Utilities Commission laid down the principle that consumers at too great a distance from existing lines or having peculiar conditions of service which make them a burden upon the general consuming public may be required to share in the special investment made to serve them. The commission said: "The power company has offered to utilize the labor of these prospective consumers in the construction of the extension in so far as they are fitted for the task at hand, or, on the other hand, is willing to let the contract for the work to any competent contractor, so that it does not appear that an injustice will be done"; but it added: "To insure the safety of both the public and employees certain standards of construction must be insisted upon."

Expenditure to Satisfy Damage Claim Arising During Construction Cannot Be Charged to Capital.—The California Railroad Commission has denied the request of the San Joaquin Light & Power Company to be permitted to include in capital account the sum of $50,000 representing an award for property damage caused during the construction of a transmission line through the burning of a wheat field. To this plea the commission replied: "This commission estimated the rate base as the reasonable historical cost of the property, and it does not appear that the cost of paying damages for the burning of a wheat field due to conditions which were deemed by the courts as negligence can be classified as a reasonable cost of the construction of the power system. The return allowed by the commission contemplates certain hazards of the business, and it would appear that damage such as the one in question represents one of those hazards which must be borne by the stockholders of the utility company."

Men of the Industry

Changes in Personnel
Accomplishments, Responsibilities, Honors, Appointments and Activities of Men
Engaged in all Branches of the Electrical Industry

A Man with a Vision

An Appreciation of John B. Miller, Who Has Built the Southern California Edison Company

TWENTY-FIVE years ago there went to southern California a man from Michigan. He had no experience in central-station operation, but he had imagination, vision, confidence, executive ability and money. He became interested in the public utility situation in that part of the country and brought about the combination of several electric light and power companies in or near Los Angeles into what later became the Southern California Edison Company. He became the president of the consolidated company at a salary of one hundred dollars a month.

J. B. MILLER

An unheard-of budget, calling for the expenditure of $50,000, had to be financed, and John B. Miller set about the task of raising this money. No man ever undertook a less promising development. For southern California was not a garden spot in those days. It was largely a desert without population, and the vision that pictured the possibilities for electrical expansion had to frame also a dream of gathering population and growing industry.

From the start Miller recognized that spiritual qualities of good service, square dealing and courteous treatment would do more than anything else to bring success to the new type of enterprise he was heading and that such an element in a community would be a great attracting force, a far-reaching appeal, that would call many people and bring them to the city he was seeking to upbuild. As the years rolled by he saw his theory proved in operation, and he continued to interpret and expound his conception of the attitude which utility officials and employees should maintain toward the public in simple words that have now become classic in the industry.

Years before the advent of regulatory commissions he instituted this policy. It is interestingly expressed by a letter that he wrote on Sept. 26, 1905, which is today held as one of the prized records in the archives of his company. He wrote:

"The Edison Electric Company desires to have the confidence and respect of the public with which it deals. Officers, agents and other employees should, in every reasonable way, endeavor to increase that confidence and respect by doing everything in their power to make the name of the Edison Electric Company synonymous in the mind of the public with good service, square dealing and courteous treatment. The public gains impression of the company through contact with its representatives, and they will, therefore, be held responsible in every instance for carrying out the well-established policy of the company—good service, square dealing, courteous treatment."

Last week men pre-eminent in the electrical industry flashed words of congratulation to Mr. Miller from every district of the country upon his completion of twenty-five years of service and as a spontaneous recognition of his success. An account of the banquet given in his honor by the other officials of the great company which he heads is contained in this week's "News of the Industry."

W. A. Whittlesey Heads Pittsfield Company

W. A. Whittlesey has been elected president of the Pittsfield (Mass.) Electric Company to succeed the late Alexander Kennedy. Mr. Whittlesey has been general manager of the company for some years past and is well known in the New England central-station field. Most of the expansion of the company's plant and service during the last decade has been under his immediate direction, including the reconstruction of the Silver Lake generating station, the arrangement of an interconnection now under construction between the Pittsfield system and that of the Turners Falls Power & Electric Company in the Connecticut Valley, and the development of an active commercial policy in electrical and merchandising sales in the upper Housatonic Valley.

Karl Smith has left Grafton, N. D., and is succeeded by E. W. Steinbuck, formerly at Kasson, Minn., as superintendent of the Grafton plant.

A. C. Marshall Assumes Office of General Manager

Alfred C. Marshall, vice-president of the Detroit Edison Company, became vice-president and general manager of the company on Feb. 1, succeeding Alex Dow in the office of general manager. Mr. Marshall and Mr. Dow have been intimately associated since 1894, when Mr. Marshall allied himself with the public lighting commission, which under the direction of Mr. Dow was building the first public lighting plant erected in Detroit.

In 1899 Mr. Marshall left the commission to become chief engineer of the "rapid railway" system which was under construction between Detroit and Mount Clemens. In 1903 he again became associated with Mr. Dow upon joining the Edison Illuminating Company, planning and superintending construction. Two years later he went to Port Huron to take charge of the electric light plant. A stay of six years in this city gave him valuable training in all phases of the electric light business. In 1911 he rejoined the Detroit Edison Company and later was elected a vice-president and director of the company.

A. C. MARSHALL

Mr. Marshall has been active in association work as secretary and treasurer of the Michigan Electric Association from 1905 to 1910 and as its president in 1911, when it was converted into the Michigan State Section of the National Electric Light Association. Mr. Dow retains his duties as president and chief executive of the Detroit Edison Company.

G. W. Barker, electric range expert of the San Francisco division of the Pacific Gas & Electric Company, has been promoted to the position of domestic-appliance sales engineer.

J. E. Harsh, general manager of the Lincoln (Neb.) Gas & Electric Light Company, has been placed in charge of the Virginia Power Company, a subsidiary property of the Doherty interests. Mr. Harsh has been in charge of the Lincoln plant for a period of more than five years.

F. L. Butler Elected Vice-President of Georgia Company

Frank L. Butler, general operating manager of the Georgia Railway & Power Company, has been elected a vice-president, in charge of operation. Mr. Butler has been associated with the company since February, 1921, when he became the manager of its railway department. One year later he was made general operating manager in charge of the railway, electric, gas and steam-

F. L. BUTLER

heating departments. For three years previous to his assuming the managership of the Atlanta's company railway department Mr. Butler was connected with the Winnipeg (Man.) Electric Railway, and he was manager of that property when he tendered his resignation to go to Atlanta. Mr. Butler was born in Terre Haute, Ind., in 1874 and at the age of twenty entered the employ of the Vandalia Railroad. Subsequently he was connected with the Denver & Intermountain Railway, the Alton, Jacksonville & Peoria Railroad and the Chicago & West Towns Railway.

Dudley Sanford, industrial engineer with the Union Electric Light & Power Company, has recently been appointed assistant treasurer of that company and treasurer of the St. Louis County Gas Company.

J. K. Leibing has severed his connection with the Great Western Power Company of California to take a position in the general engineering laboratories of the General Electric Company at Schenectady, N. Y.

T. L. Nudd, former electrical engineer with the Newbery Electric Corporation of Los Angeles, in charge of estimating and engineering, has been made electrical engineer for the Allied Architects of Los Angeles to supervise inspecting and estimating. Mr. Nudd is a graduate of the University of California and previous to his connection with the Newbery Corporation he was electrical inspector in the Bureau of Yards and Docks, Navy Department, at the San Diego public works office.

A. C. Schloth has resigned as assistant electrical engineer for the General Electric Company at Lynn, Mass.. and is devoting all of his time to patent work.

J. Elmer Housley has been recalled to his former position as electrical engineer with the Aluminum Ore Company, East St. Louis, Ill. For the past year he has been in the sales department of the Aluminum Company of America at Kansas City.

Thomas J. Rabbitt, who has been associated with the Cape & Vineyard Electric Company, Vineyard Haven, Mass., for about six years, has recently been appointed assistant manager of the company, and Theodore Chaffin, who has been in the company's service about nine years, has been appointed assistant treasurer.

F. R. Kohnstamm, who has been acting manager of the domestic heating section of the merchandising department of the Westinghouse Electric & Manufacturing Company, has been made manager of the section, and E. W. Knight, who has been acting manager of the fan section of that department, has been appointed manager of that section.

W. G. Church of Wichita Falls, Tex., formerly of Farmersville, in the same state, has been appointed general manager of the Electra (Tex.) Light & Power Company, succeeding E. D. Kelly, resigned. Mr. Church has been connected with the Mid-West Utilities Company, owner of the Electra plant, for about five years, including a period of service before the war.

A. E. Blackwell of Denver, Col., has arrived in Sedalia, Mo., to take up the duties of W. M. Little, of the distribution department of the City Light & Traction Company in Sedalia. Mr. Little has been promoted to the business department. Mr. Blackwell has been doing for the Henry L. Doherty Company in Denver similar work to that which he is now undertaking.

Morgan Brooks, professor in the department of electrical engineering of the University of Illinois, who is touring Europe on a year's leave of absence from his duties, addressed a convention of Italian electrical engineers held in Rome in January. His topic was the investigation of the fatigue of metals which is now being conducted by Prof. H. F. Moore of the department of theoretical and applied mechanics of the University of Illinois. Stereopticon slides and Professor Moore's motion-picture films were shown. Professor Brooks gave the same lecture before engineers at Prague, Czechoslovakia, in December, on the personal invitation of the President of that republic, following reports from other localities of the interest he had aroused in engineering circles. The international co-operation of engineers exerts a stabilizing influence on the unsettled world conditions, in the opinion of Professor Brooks, who reports great interest abroad in American engineering and educational progress.

B. L. Worden Succeeds Mr. Berresford

At the annual meeting of the Cutler-Hammer Manufacturing Company of Milwaukee, held Jan. 25, B. L. Worden, president and general manager of the Beaver Board Companies, was elected a director and vice-president to fill the vacancy created by the resignation of A. W. Berresford. Mr. Worden was the organizer and president of the Worden-Allen Company of Milwaukee and the

B. L. WORDEN

Lackawanna Bridge Company of Buffalo, which interests he has recently disposed of. During the late war he was general manager of the shipbuilding department of the Submarine Boat Corporation, and it was under his supervision that the shipyard at Newark Bay was built.

Wiley F. Corl, general manager of the Missouri Utility Company, Mexico, Mo., has been elected president of the Mexico Chamber of Commerce.

Obituary

Albert Brown Chandler, formerly president of the Postal Telegraph Company, died at his home in Randolph, Vt., on Saturday, Feb. 3. Mr. Chandler, who retired many years ago, was eighty-three years of age.

E. T. Nye, general manager of the West Jersey Electric Company and Five Mile Beach Electric Railway Company, died on Jan. 30 at his home in Wildwood, N. J. Mr. Nye had been with these companies for sixteen years and before filling his post at Wildwood had charge of the electric light company in Pleasantville, N. J.

John Warren Sargent, a widely known designer and builder of stationary engines and junior member of the former firm of Rice & Sargent, Providence, R. I., died at Providence on Jan. 30. During the past few years Mr. Sargent had devoted himself mainly to research work in connection with prime movers. He was born at Amesbury, Mass.

Manufacturing and Markets

Devoted to the Discussion of Business and Economic Problems of the Producer and Distributor, with Market Reports, Trade Activities, Foreign and Construction News

Price, Selling Cost and the Non-Electrical Distribution*

By W. R. Herstein
Vice-President and General Manager
Electric Supply Company, Memphis, Tenn.

WE HAVE now reached a point in the wholesaling of electrical supplies where, in my opinion, a well-defined issue presents itself to the jobber. This plain, clean-cut issue is, Shall we continue to accept business wherever offered or shall we endeavor to confine our own particular lines to customers who will co-operate with us in the endeavor to keep quality above price, and to pass the product into the hands of the user through the medium of intelligent salesmanship?

Price the Chief Interest

My first impression in attempting to sell to the non-electrical dealer was that he had little or no regard for quality, which I had been trained almost to reverence, but was chiefly interested in price. He simply knew nothing regarding electrical devices and was not qualified to judge between good and bad. Subsequently, however, he did become qualified, but his interest in price remained unabated, because he was now selling electrical devices at very low prices, as a leader, to draw trade to his store. Furthermore, in order to sell to him, our maximum discounts, regardless of quantity, were demanded, because he was a subscriber to a purchasing syndicate in New York, and if we would not sell him on his own terms, the business went to the syndicate. Still further, his practice of cutting the price on nationally advertised articles caused dissatisfaction on the part of our other dealers in that particular town, and when he advertised these prices in a newspaper that had a state-wide circulation the dissatisfaction extended to our dealers throughout the state.

You will note that I have not said whether this dealer was a department store, grocer, druggist or hardware dealer. He might have been, and in the course of time was, either one or all of them. Then this curious thing began to happen: Some of my local friends who are jobbers in other lines began asking me about the electrical jobbing business. Their interest, they frankly stated, was aroused by requests from their customers—whom I had foolishly begun to believe were mine—that they should carry in stock certain devices such as dry batteries, flashlamps, incandescent lamps, etc., which they had theretofore been buying from electrical jobbers, but which they preferred getting with other goods from their main source of supply. Here, therefore, was another more or less formidable legion of competitors — competitors, too, knowing nothing of the traditions of the trade. And since the manufacturers of inferior electrical devices are not going out of business, let me recommend to the makers of higher-grade goods that they let the low-grade manufacturer take the non-electrical jobber's business and refrain from forcing his attentions upon the strictly electrical jobber

Qualifications of Contractor

It will be easily inferred that my own judgment in the choice of retail distributors points unqualifiedly to the electrical man. I have intimated the necessity for technical knowledge in salesmanship, but have not enlarged upon this point because the non-electrical dealer can easily hire help of this character. As a matter of strict fact, we know that he seldom does, but my main objection to him may be summed up in the expression that he is too close, if not absolutely unfair, in buying; he has too little regard for quality, and he does not remain permanently the electrical jobber's customer. I do not accuse him of inability in the matter of servicing goods sold, but he is frequently as indifferent in this respect as he is in the matter of hiring qualified salesmen.

The principal criticisms of the electrical contractor as a retailer are:

1. He is not a merchant and, by inference, never will be one.
2. His credit rating is, as a rule, unfavorable.
3. He is lacking in aggressiveness.

It has been said that the majority of electrical contractors and dealers fail. Granting, solely for the sake of the argument, that this is true, it is not the failures that I am talking about, but the successes.

Discounts Too Small

If there is any great degree of reason for the charge of inefficiency and incompetency against the electrical retailer, there is abundant defense to be introduced in his behalf. The retailer has never been treated fairly in the matter of remuneration, and he has frequently been subjected to crushing competition by the very jobbers who condemn him. He has been asked to maintain a high-class establishment, frequently in the heart of the high-rent district, with well-paid, neatly dressed, skilled and technical salesmen, and to pay for this out of a commission of 20 to 30 per cent, when his neighboring retailers in other lines receive more than double for services of the same, or less efficient, character.

In recent years sympathy for the retailer has increased, and the conviction has gradually been forced home to jobbers and manufacturers that if this class of customer is to survive at all, fairer treatment must be accorded him. His discounts are slowly but surely creeping through the "thirties" and up to 40 per cent. Nothing less than 40 per cent on ordinary lines will ever save the situation for the electrical retailer. He is no more of a miracle worker than retailers in other lines, and if they must have it, so must he. On specially difficult lines, such as

*From an address before the winter meeting of the Electrical Supply Jobbers' Association, Cleveland.

motor-driven devices, even better than 40 per cent must be given him if he is both to market the device and service it six months or a year without additional compensation.

COST OF MARKETING

Forty per cent for the retailer, with reasonable compensation for the jobber, means that the jobber and dealer are to receive as much for selling the device as the manufacturer gets for making it. At first blush, it might seem that here is fine political capital for the well-known case of the People versus the Middleman, but a cold and dispassionate analysis of the evidence shows differently.

So long as the public will not go to Pittsburgh for its steel, just so long must steel products be kept on display in retail stores from Maine to California. And so long as the people will not go into the outskirts of the city or its manufacturing and wholesale districts to make their purchases, just so long must the retailer remain in the high-rent district at the expense of the people. Many things combine to make the task of marketing difficult, and who shall say that the man who sells does not do as good a job as he who makes? Shall he not, then, be entitled to equal compensation?

Thus far I have said little or nothing regarding the central station's part in the retail business. Until recent years the central-station idea was that the devices were to be sold for the purpose of creating an off-peak load, and that profit from sales of the devices themselves was of no consideration. Only recently has it become an accepted theory that the merchandise itself must pay its own way, and here the central station has found its position superior in no way to that of the ordinary retailer, so far as overhead expense goes.

MANUFACTURING EFFICIENCY NEEDED

To summarize the situation, I should say that the jobber is in the industry permanently; that he can handle these lines most economically through the electrical contractor-dealer and, to a limited extent, through the central station. I would say that whoever retails electrical appliances will have to be paid a price commensurate with the work done and the expense involved; that if, after according the jobber and retailer their necessary remuneration, the public will not pay a retail price that leaves the manufacturer a profit, then the manufacturer must become more efficient. Ours is a comparatively new industry, and perhaps our manufacturers still have something to learn.

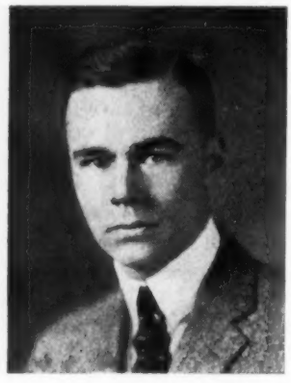
An electric range, for instance, ought not cost half as much as a Ford automobile. The rugged structure of a 16-in. desk fan ought not cost twice as much as the delicate mechanism, assemblage and calibration of a 5-amp. wattmeter. A coffee percolator should not cost as much as it takes to ship a thousand pounds of them a thousand miles. The jobbers have recently given largely of their time and money to ascertain their own cost of operation and have gladly welcomed the offer of the manufacturers to police this investigation. Would the converse hold good, and may we some day see the manufacturers investigating their own costs with the steadying influence of jobber supervision over the work?

And, finally, would it not be well for both jobber and manufacturer to realize that their interest in an electrical appliance is not ended until it reaches a satisfied consumer, and that satisfied consumers will come only through satisfactory retailers?

Competition in the Heating Line

A Few Reflections on the Influence of Business Rivalry—Reasons Why We Need Not Fear Though Patent Bars Are Down

BY THOMAS C. RUSSELL
President and General Manager
Russell Electric Company, Chicago, Ill.



T. C. RUSSELL

WE WHO are in the business of manufacturing electrically heated appliances are apt to forget when we contemplate the expiration of the Marsh patents this month that competition does us good. The Japanese people probably owe their sturdiness and perseverance largely to the fact that they have lived for ages in a land which, except for about one-eighth of its area, is all cruel mountains. Combat strengthens manhood. I believe it was Theodore Roosevelt who said, "The highest type of man that civilization has produced is a fighting man."

So it is in the field of manufacture. Competition is sometimes destructive, but it certainly sharpens the wits and forces progress in the art and in the industry.

My company for some years has been manufacturing a number of moderate-priced electric heating specialties in competition with the established older, higher-priced lines. Our business has been developed in the face of the keenest competition with well-organized and amply financed concerns of large experience. We have found ways to manufacture quality products at lower than prevailing costs and therefore have been able to sell at very moderate prices. Out of this has come a distinct stimulus to all the manufacturers of these goods, and the public today has a better curling iron, a better grill and better values in other specific appliances than it would have if no competition had impelled us all to eagerness to better our product and reduce the cost. Easy money has ruined many a good business.

There is only one kind of competition that any manufacturer, jobber or dealer in heating appliances need fear—devices that are made for price only and without regard to quality. But such competition is always temporary. In a little while the dealer who sells it finds his customers complaining and he learns his lesson. For it is good will that makes business for the manufacturer, the jobber and the dealer.

The man who starts to sell cheap

stuff makes money, but he loses customers and he soon finds that it costs him more than he makes. Quality is not just a moral obligation; it is a business necessity. If the goods fall down, the woman who owns them looks to the dealer for protection, the dealer looks to the jobber, and the jobber falls back on the man who sold to him, and the business crumples up. We all have a responsibility to prevent the sale of dangerous appliances, but competition in the production of a reliable product is a good thing for us all.

The American people want a guarantee that stands permanently behind the goods and a price that pays an ample profit, but shares with them the benefits of low cost. They know that the man who does not make sufficient on his goods to prosper cannot provide for the protection of his customers, and without this he cannot succeed.

To Prosper the First Duty

It is the first duty of the manufacturer, therefore, to prosper by conducting his business on an economic basis so that his costs may be low and so that he can sell at a reasonable price. If he does this he need not fear competitors. For if he cannot make good merchandise and compete with other men selling good products, at a good profit, he has no right to occupy the stage.

Many men feel that the methods and policies under which they run their business enterprises are entirely their own private affairs, but this is not the case. The prices at which they and their competitors sell their goods are a matter of concern to the industry. It is good business methods that make possible low cost, and it is low cost that makes possible low price. The way the manufacturer of heating appliances conducts his business, therefore, has a lot to do with his ability to meet the more active competition that will undoubtedly come now that all bars are down. Nobody will be able to come in and overnight learn all the kinks of the busines. The losses which the experienced manufacturers have had to stand from time to time are witness to the fact that the newcomers will find it a hard field to work. It will take time for them to learn both their product and their market.

In the meantime it behooves the present manufacturers to look to their efficiencies, not alone in manufacturing but in selling. They must recognize the fact that good customers must not be undermined by selling "fly-by-nights." It is possible to combine an easy credit policy and stiff collections or stiff credits and easy collections, but easy credits and easy collections do not go together. Full financial responsibility right down the line is absolutely vital to permanent success.

Business Conditions

A Survey of Important Developments in the Electrical Market Including Data on Production, the Sales Outlook, Credits, Exports, the Metals and Other Conditions Affecting Cost, Supply and Demand

Electric Refrigeration Faces Active Season

Owing to unusually snowy weather without periods of extreme cold of sufficient length to form a normal ice crop, many localities in the North and East will furnish remarkably good markets for electric refrigerating equipment during the coming spring and summer. In New England the alternation of snow with warm rains has resulted in the formation of ice of inferior quality and abnormally small thickness. Many cases have occurred where the ice ponds have been cleared of snow only to have these labors rendered vain by the arrival of another storm before harvesting could take place. Predictions are that the ice crop will be small and next summer's prices high. Manufacturers of refrigerating equipment are working hard in preparation for this business, and vigorous efforts are in prospect by central stations and contractor-dealers to cultivate this class of service through intensive advertising and solicitation.

Increase in Use of Electric Signs in England

A noticeable increase in the use of electric signs for advertising purposes is taking place in England, according to reports to the United States Department of Commerce. The development of this means of public display, however, in no way approaches that of cities of similar size in the United states. Usually they consist only of an illuminated word or two concerning the firm or the product advertised. Some are lighted continuously and others flash off and on. Only in a very few instances are colored lights used, and the result is not particularly effective.

Number of Delinquent Electrical Accounts Increases

The delinquent electrical account report prepared by the Electrical Credit Association has Chicago in the lead with 1,104 accounts for December, 1922. This is a gain of 291 over November, but a lower average amount by $48.18. Compared with November and December, 1921, the December, 1922, account is lower by 53, but an increase in value from $107.49 to $125.84.

New York is next on the list, with 485 old accounts in December, 1922, as against 434 in December, 1921, with a respective average value per account of $193 and $136. The gain over November, 1922, is 96 accounts, but a decreased average value of $25. The list of accounts is as shown below:

VALUE AND NUMBER OF DELINQUENT ELECTRICAL ACCOUNTS

Branch and month	Number of Delinquent Accounts Reported	Total Amount	Average Amount
Central Division:			
November, 1921	1,111	$142,209.09	$128.00
November, 1922	813	141,482.10	174.02
December, 1921	1,157	124,376.98	107.49
December, 1922	1,104	126,342.89	125.84
New York:			
November, 1921	328	57,550.00	173.00
November, 1922	389	84,743.00	218.00
December, 1921	434	58,840.00	136.00
December, 1922	485	93,428.00	193.00
Philadelphia:			
November, 1921	202	26,540.09	131.43
November, 1922	215	24,703.46	114.90
December, 1921	186	28,992.97	155.87
December, 1922	183	19,307.58	105.51
New England:			
November, 1921	68	7,912.95	116.37
November, 1922	47	6,130.29	130.43
December, 1921	44	8,484.25	192.82
December, 1922	34	3,809,68	112.05
Pacific Coast:			
November, 1921	16	1,054.82	65.92
November, 1922	24	4,117.10	171.54
December, 1921	23	2,667,74	107.72
December, 1922	14	2,225.43	158.90

Comparative Prices of Station Supplies

	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars, per lb.	$0.030	$0.0295	$0.0271
Cold finished shafting, per lb.	0.0385	0.0378	0.0333
Brass rods, per lb.	0.1742	0.171	0.155
Solder (half and half), per lb.	0.2425	0.24	0.2075
Cotton waste, per lb.	0.1175	0.11	0.106
Washers, cast iron (⅛-in.), per 100 lb.	4.33	4.33	3.65
Emery, disks, cloth, No. 1, 6-in. diameter, per 100	2.96	3.11	3.11
Machine oil, per gal.	0.36	0.36	0.40
Belting, leather, medium, off list	49%	30-10%@50%	46%
Machine bolts, up to 1-in. x 30-in., off list	51⅓%	55%@60%	64⅓%

Vacuum Cleaner Sales Increase 15 to 25 per Cent in Six Months

Although this time of the year is generally known as a dull season for vacuum cleaners, manufacturers of grades featured in the larger of the advertising campaigns report increasing sales. These increases range from 15 to 25 per cent heavier than six months ago, which was a season that required less sales effort. Deliveries generally are normal, in some cases it having been necessary to carry on overtime work in order to keep up with orders. Some of the makers of quality cleaners who at the present time report increases in sales ranging from 15 to 20 per cent state that they are confident that their business will grow 15 per cent more during the next half year if their present intensified sales efforts are continued.

Wholesome Growth in Radio Industry

David Sarnoff, vice-president and general manager of the Radio Corporation of America, believes that the growing increase in sales of complete sets is one of the most wholesome signs of progress that have yet been seen in the radio industry.

"Amateurs who are really young experts have succeeded in putting together sets that have given very creditable results," Mr. Sarnoff said. "They have understood every feature of such a set, operating it with expert knowledge and affectionate regard. Complete sets, however, embody the research and skill of America's foremost radio engineers. From these complete sets the amateurs are obtaining amazing results when conditions are right.

"No one ever dreamed when radio was first discussed that it would be possible to manufacture a home receiving set at a cost that makes possible the low prices now prevailing. The development of manufacturing processes has tended steadily toward simplification, and whereas at the beginning the sales were mainly among the amateurs, the public generally is now beginning to install radio receiving sets.

"There has been a growing appreciation of the fact that expert knowledge is not needed when complete sets are bought. The first big rush of buying came from the amateurs. When this first big demand was supplied there was a noticeable tendency on the part of dealers to wonder why sales had fallen off.

"As a matter of fact, the radio industry had really reverted to normal. It had established itself upon a regular merchandising basis. The increase in business, which began in September, was based upon a growing appreciation by the general public that radio is here to stay and broadcasting is here to stay.

"The growing increase in the sale of complete sets is one of the most wholesome signs of progress that have taken place in the radio industry. It means that the merchandising phase has arrived and is on a sound basis."

Electrical Exports in 1922 Were $63,213,838

Electrical exports from the United States during the year 1922 amounted to $63,213,838, according to the Bureau of Foreign and Domestic Commerce of the Department of Commerce. This figure shows a falling off of $32,601,047 from the figures of 1921, when exports amounted to $95,814,885, and a falling off of $38,776,166 from the figures for 1920, when they amounted to $101,990,004. Electrical exports for December, 1922, and for the years, 1920, 1921 and 1922 are as follows:

ELECTRICAL EXPORTS FOR THE YEAR 1922

Articles	Value December, 1922	Value Total Year 1922
Turbines	$99,335	$1,720,480
Generators		
Direct-current—		
Under 500 kw.	50,446	535,501
Over 500 kw.	62,684	998,975
Alternating current—		
Under 2,000 kva.	29,000	290,668
Over 2,000 kva.	360,556	1,412,262
Accessories and parts for generators	20,994	1,135,736
Self-contained lighting outfits	28,701	441,569
Batteries		
Primary, dry	90,928	1,047,093
Primary, wet	391	35,992
Storage	133,300	1,473,560
Transforming and converting apparatus:		
Transformers, power	247,103	4,158,798
Transformers, other	78,011	747,324
Rectifiers	12,361	61,208
Condensers, double-current and motor-generators, dynamotors, synchronous and other converters	51,224	1,305,200
Transmission and distribution apparatus:		
Switches and panelboards, except telephones	259,977	2,701,508
Switches and circuit breakers	166,546	1,891,921
Fuses and fuse plugs	24,978	198,665
Meters and measuring instruments:		
Watt-hour and other measuring instruments	52,602	564,476
Volt, watt and ampere meters, and other recording, indicating and testing apparatus	141,322	876,453
Lightning arresters, choke coils, reactors and other protective devices	100,970	678,438
Motors, starters and controllers:		
Motors under 1 hp.	77,059	772,433
Stationary motors—		
1 to 200 hp.	212,300	2,037,231
Over 200 hp.	45,386	665,967
Railway motors	89,743	480,149
Electric locomotives		
Railway	140,703	853,562
Mining and Industrial	.....	224,645
Other motors	6,389	351,384
Rheostats, controllers and other starting and controlling equipment	159,949	920,118
Accessories and parts for motors	86,377	1,138,241
Electrical appliances:		
Electric fans	92,009	816,116
Electric lamps:		
Arc	842	21,115
Incandescent—		
Carbon-filament	8,927	62,393
Metal-filament	89,380	1,224,630
Other electric lamps	19,617	184,421
Flashlights	30,734	253,623
Searchlights and projectors	47,076	279,801
Motor-driven household devices	67,943	641,608
Domestic heating and cooking apparatus	62,357	596,895
Therapeutic apparatus, X-ray machines, galvanic and faradic batteries	46,625	585,987
Signal and communication devices:		
Radio and wireless apparatus	163,236	2,897,799
Telegraph apparatus	53,677	316,299
Telephone apparatus, including switchboards	376,955	4,391,498
Police, fire and burglar alarm apparatus	10,160	43,234
Railway signals, switches and appurtenances	140,778	685,227
Bells, buzzers and annunciators	7,006	63,563
Other electrical apparatus and appurtenances:		
Spark plugs, magnetos and other ignition apparatus	129,537	1,092,931
Insulating material	99,977	876,003
Metal conduit, outlet and switch boxes	21,851	295,194
Sockets, outlets and receptacles	74,310	488,703
Other wiring devices	176,620	1,342,426
Other electrical apparatus, not elsewhere specified	631,056	7,844,250
Globes and shades for lighting fixtures	45,746	440,997
Electrical glassware, except for lighting	25,027	172,890
Electrical porcelain	93,030	1,379,750
Carbons for electric lighting, electrodes and batteries	98,106	1,098,094
Insulated wire and cable (iron and steel)	24,906	377,927
Other manufactures of aluminum	53,579	925,238
Copper:		
Bare wire	135,065	1,875,422
Insulated wire and cable	175,728	1,982,093
Total electrical machinery, apparatus and appurtenances	$5,836,391	(1922) $63,213,838
(1921)	5,177,276	(1921) 95,814,885
(1920)	13,812,180	(1920) 101,990,004

New England's Growing Volume of Business Helping Collections

Collections in New England are responding to the growing volume of business in manufacturing and jobbing circles, and continued favorable terms for money are helping to restore more stable conditions in the electrical field. Representative houses are rounding up their accounts in an average of fifty-eight to sixty days, although some outstanding paper is not taken care of under eighty or ninety days. Improved relations between central stations and contractor-dealers are doing their part in establishing better conditions. Railroads, central stations and large industrial plants are meeting their obligations well and considerable discounting of bills is being practiced by larger buyers. Overcompetition has tended to reduce somewhat the number of organizations undertaking to do electrical supply jobbing in this territory. While the cost of doing business is still very high, increasing volume of trade is a powerful factor in creating favorable sentiment toward the year's prospects, and there is nothing in sight to justify disquiet as to collections in the next few weeks.

The Metal Market

Copper Continues Strong at 15 Cents—A Few Others Selling at 15.12½ Cents

The copper market continues strong, most holders quoting 15 cents a pound. A few other big selling agents are firmly quoting 15.12½ cents and show no inclination of reducing their price to 15 cents to attract some of the going business. These latter sellers are steadfast in their opinion that the market is due to go higher, especially if the present demand from the consumers continues. Export business in copper is slightly better, although orders are not large. Quotations are unchanged at 14.75 to 14.80 cents, f.o.b. New York harbor, and 14.95 to 15 cents, c.i.f., European ports.

NEW YORK METAL MARKET PRICES

	Jan. 31, 1923 Cents per Pound	Feb. 6, 1923 Cents per Pound
Copper		
Electrolytic	14.87½–15.00	15.00–15.12½
Lead, Am. S. & R. price	7.75	8.00
Antimony	7.00	7.50
Nickel, ingot	30.00	25.00–30.00
Zinc, spot	7.00	7.05
Tin Straits	38.62½	39.00
Aluminum, 98 to 99 per cent.	23.00	22.00–23.00

Copper and Brass Products

Copper, brass and bronze mills quote the following prices on brass and copper products:

Copper wire, 16.38 to 16.63 cents net, mill; brass wire, 19.5 to 21.5 cents; copper sheets, 22.25 cents; copper rods, 15.5 to 15.75 cents; brass rods, 17.25 to 21.38 cents; sheet brass, 19 to 20.63 cents.

The Week in Trade

Prices When Quoted Are Those Reported at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

PRICES of wire, conduit and flexible cable are slightly stronger owing to the continued heavy demand by the building industry and to longer deliveries. A noticeable spurt in sales of high-tension equipment and poles to central stations that are making extensions and repairs is reported in the Far West and Middle West. Some labor trouble in the textile field and telephone unions is causing concern. Electrical interests are well satisfied with the building outlook for the spring and summer months. Motor manufacturers report increasing business and fair stocks. One maker of a quality vacuum cleaner reports that his sales are 25 per cent heavier than they were six months ago, 15 per cent of this increase being laid to improved business conditions and the remaining 10 per cent to greater sales effort. Keen competition in metal reflector fixtures along the Pacific Coast has resulted in a 10 per cent price drop. Retail trade has been hampered somewhat by the colder weather, although the volume of heater sales is disappointing. Stocks of complete radio sets are reported spotty.

New York Demand for all appliances is only fair, a lull which is expected to be of short duration. Supplies and equipment to central stations show some improvement. Jobbers and contractors expect the coming year's construction of industrial and residential buildings to bring record-breaking orders. Fixtures are on a keen merchandising basis, with firm prices. Motors are showing improvement and stocks are only normal. Radio shows added strength with stocks of the better sets in a decreased state.

Chicago Basic commodities, including wire, conduit and flexible cable, are selling well. Shipments of conduit are improving, but the present demand is too great to allow much stocking up on this material. Jobbers report a fair trade in fuses, schedule material and fixtures, since most of the building construction will not be finished until April. Motor manufacturers declare that January was a continuation of December's sales rate.

Boston Retail trade has been hampered somewhat by cold weather. Manufacturers are well supplied with orders for many weeks ahead in most lines. Radio stocks are spotty in the face of a heavy demand for apparatus, greatly stimulated by improved broadcasting programs. Labor conditions are disturbed in the textile field, with internal difficulties evident in the telephone unions. The outlook is good for an active spring in the building industry, with price conditions in control of commitments for summer and fall.

Baltimore Business is proceeding at a normal rate with an upward trend shown in the prices of cable and wire. Most of the jobbers are well stocked. Although prices are remaining firm on heaters, the demand is beginning to show a seasonal decline. Motors, although showing a steady demand, are declining considerably in price. Business during the month of January was reported as very good from practically all the dealers and jobbers, and the outlook is good.

Atlanta Shipments on heavy electrical apparatus are lengthening. Jobbers report business as a whole very good with a pick-up in the demand for pole-line hardware as a result of the sleet storm of ten days ago. The volume of heater sales is disappointing. Telephone interests in this district have announced a program of expansion which will call for the expenditure of $1,500,000 during the coming year.

Cleveland Trade generally continues brisk and the volume has been distributed over many commodities. Collections are improving. Manufacturers are increasing production in anticipation of heavy buying in the spring. Despite the colder weather, building operations continue to maintain a strong demand for fixtures and lamps. Appliance sales are fair. Heaters are improving.

Pittsburgh Increasing business in the jobbing field is reported. Prices generally are firm, and stocks are quite well maintained. Rubber-covered, bare and weatherproof wire have shown a slight advance with a steady demand. Central-station business is more active than during the month of January. Collections generally are improving. Orders for central-station equipment are larger.

St. Louis Jobbing business continues to improve. The holiday demand had a stimulating effect upon the distribution of radio sets, household appliances and fancy lamps. The almost uninterrupted building operations due to the open winter have been reflected in orders for wiring, which are reported as unusually heavy for this season of the year.

New Orleans A slight increase in business is noticeable, dealers and jobbers reporting good sales in appliances and lamps. Central-station equipment is moving in larger volume. Collections are somewhat improved. Building construction continues at a fair rate.

Demand, Supply and Price Trend of Eighteen Commodities as Sold in Sixteen Cities

Explanation:
Demand: Steady, Slow or Active
Supply: Normal, Low or High
Price Trend: Firm, Decreasing or Increasing

Next Week
Reports will include
Washers and Cleaners,
Conduit Boxes and Tape

	Wire	Armored Cable	Conduit	Transformers	Poles	Pole Line Hardware	Porcelain	High Tension Equipment	Fuses	Meters	Switches	Wiring Devices	Lamps	Commercial Fixtures	Motors	Radio	Rectifiers	Heaters
New York																		
Demand	Act.	Act.	Sdy.	Slow	Slow	Sdy.	Sdy.	Slow	Act.	Spy.	Sdy.	Sdy.	Act	Sdy.	Sdy.	Act.	Sdy.	Slow
Supply	Nml.	Hi.	Low	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Low	Low	Nml.
Price trend	Inc.	Inc.	Inc.	Firm	Firm	Firm	Firm	Inc.	Inc.	Firm	Firm	Inc.	Firm	Firm	Firm	Firm	Firm	Firm
Chicago																		
Demand	Act.	Sdy.	Act.	Sdy	Sdy.	Slow	Slow	Act.	Sdy.	Sdy.	Sdy.	Sdy.	Act.	Sdy.	Act.	Sdy.	Act.	Slow
Supply	Nml.	Nml.	Low	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Low	Nml.
Price trend	Inc.	Inc.	Inc.	Firm	Firm	Firm	Firm	Firm	Inc.	Firm	Firm	Inc.	Firm	Firm	Firm	Dec.	Firm	Firm
Boston																		
Demand	Act.	Act.	Act.	Slow	Slow	Slow	Slow	Slow	Sdy.	Sdy.	Act	Act.	Act.	Sdy.	Sdy.	Act.	Act.	Slow
Supply	Nml.	Nml.	Low	Nml.	Nml.	Nml.	Nml.	Low	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Low	Low	Nml.
Price trend	Firm	Inc.	Inc.	Firm	Firm	Firm	Firm	Inc.	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Baltimore																		
Demand	Act.	Slow	Act.	Sdy.	Slow	Slow	Sdy.	Slow	Act.	Slow	Act.	Act.	Act.	Sdy.	Sdy.	Sdy.	Sdy.	Slow
Supply	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Low	Nml.	Nml.	Nml.	Nml.	Low
Price trend	Inc.	Inc.	Inc.	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Dec.	Firm	Firm	Firm
Atlanta																		
Demand	Act.	Act.	Act.	Sdy.	Act.	Act.	Act.	Slow	Act.	Slow	Act.	Act.	Act.	Act.	Slow	Act.	Act.	Slow
Supply	Low	Nml.	Low	Nml.	Nml.	Nml.	Nml.	Low	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Low	Low	Nml.
Price trend	Inc.	Inc.	Firm	Firm	Firm	Firm	Firm	Firm	Inc.	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Cleveland																		
Demand	Act.	Sdy.	Act.	Slow	Slow	Slow	Slow	Slow	Sdy.	Sdy.	Act.	Act.	Act.	Act.	Act.	Sdy.	Sdy.	Act.
Supply	Nml.	Nml.	Low	Nml.	Nml.	Low	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Low	Nml.	Nml.	Nml.	Nml.	Low
Price trend	Firm	Inc.	Inc.	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm.	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Pittsburgh																		
Demand	Act.	Sdy.	Act.	Sdy.	Sdy.	Act.	Sdy.	Sdy.	Sdy.	Sdy.	Sdy.	Sdy.	Sdy.	Sdy.	Sdy.	Sdy.	Sdy.	Sdy.
Supply	Low	Nml.	Low	Nml.	Nml.	Low	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.
Price trend	Inc.	Inc.	Firm	Firm	Firm	Firm	Firm	Firm	Inc.	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
St. Louis																		
Demand	Sdy.	Sdy.	Sdy.	Sdy.	Slow	Sdy.	Sdy.	Act.	Sdy.	Slow	Sdy.	Sdy.	Sdy.	Act.	Act.	Act.	Act.	Slow
Supply	Nml.	Nml.	Low	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Low	Low	Low	Nml.
Price trend	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Dec.	Firm	Firm
New Orleans																		
Demand	Sdy.	Sdy.	Sdy.	Sdy.	Sdy.	Act.	Slow	Slow	Sdy.	Sdy.	Sdy.	Act.	Act.	Act.	Sdy.	Slow	Sdy.	Slow
Supply	Low	Nml.	Low	Nml.	Low	Low	Nml.	Low	Nml.	Nml.	Nml.	Low	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.
Price trend	Inc.	Inc.	Inc.	Firm	Inc.	Inc.	Firm	Firm	Firm	Firm	Firm	Inc.	Firm	Firm	Firm	Firm	Firm	Firm
St. Paul-Minneapolis																		
Demand	Act.	Slow	Sdy.	Sdy.	Sdy.	Sdy.	Sdy.	Sdy.	Sdy.	Sdy.	Sdy.	Sdy.	Act.	Act.	Slow	Act.	Act.	Slow
Supply	Nml.	Nml.	Low	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Low	Nml.
Price trend	Inc.	Firm	Firm	Firm	Firm	Inc.	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Salt Lake City																		
Demand	Act.	Sdy.	Act.	Sdy.	Sdy.	Slow	Act.	Sdy.	Slow	Sdy.	Sdy.	Sdy.	Act.	Act.	Slow	Sdy.	Sdy.	Slow
Supply	Nml.	Nml.	Low	Nml.	Nml.	Nml.	Low	Nml.	Hi.	Nml.	Nml.	Low	Hi.	Nml.	Nml.	Nml.	Nml.	Nml.
Price trend	Inc.	Firm	Inc.	Firm	Inc.	Inc.	Inc.	Firm	Firm	Firm	Firm	Inc.	Firm	Inc.	Firm	Firm	Firm	Firm
Denver																		
Demand	Act.	Act.	Act.	Slow	Poles	Act.	Act.	Slow	Act.	Slow	Sdy.	Act.	Sdy.	Act.	Slow	Act.	Sdy.	Act.
Supply	Nml.	Low	Low	Low	Act.	Low	Low	Low	Nml.	Nml.	Low	Nml.	Hi.	Hi.	Nml.	Nml.	Low	Low
Price trend	Inc.	Inc.	Inc.	Firm	Firm	Inc.	Firm	Firm	Inc.	Firm	Firm	Inc.	Firm	Firm	Firm	Firm	Firm	Firm
San Francisco																		
Demand	Act.	Sdy.	Act.	Sdy.	Sdy.	Act.	Sdy.	Sdy.	Sdy.	Sdy.	Sdy.	Act.	Act.	Act.	Sdy.	Sdy.	Sdy.	Act.
Supply	Hi.	Nml.	Low	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Low	Nml.	Nml.	Nml.	Hi.	Low	Nml.
Price trend	Firm	Firm	Firm	Firm	Firm	Firm	Dec.	Firm	Inc.	Firm	Inc.	Inc.	Firm	Dec.	Firm	Firm	Dec.	Firm
Portland-Seattle																		
Demand	Sdy.	Slow	Act.	Act.	Act.	Act.	Slow	Sdy.	Sdy.	Act.	Sdy.	Sdy.	Act.	Sdy.	Sdy.	Sdy.	Sdy.	Slow
Supply	Nml.	Nml.	Low	Nml.	Nml.	Nml.	Nml.	Low	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.	Nml.
Price trend	Inc.	Firm	Inc.	Firm	Inc.	Firm	Firm	Firm	Firm	Firm	Firm	Inc.	Firm	Firm	Firm	Firm	Firm	Firm

St. Paul-Minneapolis Business is excellent with retail buying above normal. Construction of buildings continues at a fair rate helped by open winter weather. Dealers are showing their confidence in the general situation by ordering in large amounts. Demand for complete radio sets and parts is increasing. Radio stocks are low and there is a shortage of quality material. A big demand for rectifiers continues with very low stocks.

Salt Lake City The market is steady with no important changes from prices of last week. Jobbers and dealers generally have settled down to hard sales work, adhering strictly to budget limits and keeping to conservative lines. Washer campaigns will be on with the arrival of March, and the tendency will be to limit advertising expenditures. A shortage of skilled labor is expected as construction increases.

Denver Sudden cold weather has retarded building construction for the first time. Building permits are increasing, the total for the year thus far having passed $1,500,000, and this represents a 30 per cent increase over the corresponding period of last year. Railroads and industrial plants are making extensive inquiries relative to electrical installations, and a number of central stations in this district are planning improvements.

San Francisco Sales continue at a fair rate. Several jobbers are engaged in fixture-sales campaigns and are helped by extensive advertising. There is keen competition along the entire coast in the metal reflector market, which has resulted in a 10 per cent price drop and slower deliveries from the factories. Radio stocks are rather spotty and demand continues fair. Prices are firm.

Portland-Seattle Business reports indicate very little change, sales remaining good for this time of the year. There seems to be no indication of a slackening in the demand for materials entering into new construction. Electrical permits in building show an appreciable increase over December, 1922, the valuation for Portland being 30 per cent greater. All the larger power companies in the Northwest are working on developments of considerable magnitude.

Activities of the Trade

Devoted to News of the
Manufacturer, Jobber, Agent, Contractor and Dealer, Including Important Orders and Contracts for Apparatus and Equipment

Wagner Electric Elects Officers

At a meeting of the board of directors of the Wagner Electric Corporation held Jan. 25 the following officers were elected: W. A. Layman, president; A. H. Timmerman, vice-president; P. B. Postlethwaite, vice-president; T. T. Richards, vice-president; V. W. Bergenthal, treasurer, and J. W. Wescott, secretary. According to officials of the corporation, miscellaneous general sales for the months of December and January increased more than 100 per cent over those of one year ago, and January plant production will be 100 per cent greater than for the same month last year.

Electric Truck Sales Conference

The Cowan Truck Company, Holyoke, Mass., held a three-day sales conference from Jan. 27 to 29, the sessions being at the company's plant in Holyoke and at a local hotel. A complete tour of inspection of the works was made and a new model electric truck was demonstrated. On Jan. 28 Col. Charles R. Gow, Boston, president of the Associated Industries of Massachusetts, addressed the officers and salesmen on "The Advantages and Disadvantages of Doing Business in New England."

Uehling Instrument Order

The Solvay Process Company, which installed 24 Uehling CO_2 recording and indicating units in its Syracuse (N. Y.) plant last October, has just ordered eight additional similar units from the Uehling Instrument Company, Paterson, N. J., for its boiler plant at the same works. This company also has numerous Uehling CO_2 recorders at its Detroit (Mich.) and Hutchinson (Kan.) plants.

Electric Sign Company Institutes Suit for Patent Infringement

A suit for infringement of patent has been instituted in the Supreme Court, New York County, by the Electric Sign Company, 240 West Twenty-fifth Street, against the Norden Electric Sign Company, American Sign Company, P. J. Martin, Inc., Atlas Electric Sign Corporation and Straus & Company, Inc., to procure an injunction restraining these companies from manufacturing electric display signs which, it is claimed, infringe upon the patents under which the Electric Sign Company is manufacturing. The patent rights involved in this suit cover a new type of electric sign, invented by Bruno von Bueltzingsloewen, for which an extremely low current consumption is claimed. The von Bueltzingsloewen patents are the property of the Electric Sign Company, which is bringing suit not only for patent infringement by the defendant companies but also for an accounting on signs already constructed by the defendants, which, it is alleged, violate the rights in question.

General Electric Workers Will Receive Stock in April

Approximately ten thousand General Electric Company employees who have been paying for the common stock of the company on the installment plan for the last two years will make final payments in March and will receive their stock probably about the first part of April. Weekly deductions, which have been made at the rate of $1 per share, will terminate March 16. First dividends on this new issue will be paid July 15. The authorization of this stock issue was for 50,000 shares with a par value of $5,000,000.

Crocker-Wheeler Enters Radio Field with New Line

The Crocker-Wheeler Company, which did a great deal of manufacturing of radio sending apparatus for the navy previous to and during the war, particularly in the line of generators and dynamotors, has now, since the development of the audion, turned its attention to receiving devices. Dr. S. S. Wheeler, the president of the company, has authorized the ELECTRICAL WORLD to announce that the company is now ready to place on the market the "Add-a-Unit" line of radio apparatus, which will consist of high-quality independent units arranged with binding posts. The various units will consist of detector tube or radio frequency amplifier or audion frequency amplifier or variometer, etc., each unit to be in a well-finished case. These units can be combined into "sets" or combinations from simple to most complex. The idea is to market them on an individual-unit basis under quantity production at a reasonable unit cost.

White-Cedar-Pole Men Meet in Minneapolis

The twenty-seventh annual meeting of the Northern White Cedar Association was held at the West Hotel, Minneapolis, on Jan. 30-31. There was a large attendance from all the cedar-pole producing and selling organizations which make up its membership.

Co-operation with the pole buyers in producing and manufacturing a better quality of white cedar pole was shown. The Northern White Cedar Association specifications were thoroughly discussed, and changes were made in inspection rules to insure the kind of poles needed for hard usage on central-station lines. To show more clearly the buyer of white-cedar poles and the public utilities just what conditions go to make up the production of "quality" poles a constructive publicity and advertising campaign was authorized.

Bussmann Company Opens New Office in Philadelphia

The Bussmann Manufacturing Company, manufacturer of fuses, St. Louis, has opened an office in the Philadelphia Bourse, Philadelphia, with A. E. Arthurs, district manager, in charge. Mr. Arthurs has been with the Bussmann company for a number of years, the greater part of time as district manager of the Pittsburgh territory. R. C. McDaniels succeeds him in Pittsburgh.

Takes Maine Pneuvac Agency

C. M. Quick, formerly Portland (Me.) manager of the Gainaday Electric Company, has been appointed agent for Maine for the Pneuvac Company, Worcester, Mass., with a new office under the name of the C. M. Quick Electric Company, 548½ Congress Street, Portland.

The Electrical Appliance Manufacturing Company, Waterbury, Conn., has purchased land and buildings at 987 Watertown Avenue, Waterbury, and is altering the buildings for its own occupancy.

The Litcher Electric Company, 41 Market Avenue, Grand Rapids, Mich., manufacturer of electrical equipment, is completing plans for three-story and basement works, to replace its plant recently destroyed by fire.

Westinghouse Awards Contract for $200,000 California Plant

The Westinghouse Electric & Manufacturing Company has awarded a contract for the erection of the first unit of its proposed plant at Emeryville, Cal., where a site of 12 acres has been acquired. The structure will be one and two-story and is estimated to cost close to $200,000. Other units of approximately the same size and cost will be built later. The present plant will be operated by the Westinghouse High Voltage Insulator Company, a subsidiary organization, with headquarters at Derry, Pa., and will be devoted exclusively to the manufacture of high-tension insulators, utilizing local clays for raw material. The main building will consist of four oil-burning kilns, to be extended later to twelve such kilns. The initial working force will approximate one hundred operatives. Ray P. Hunt, manager of the material and process department at the East Pittsburgh works of the parent organization, has been appointed manager of the new Emeryville plant.

Foreign Trade Notes

NEW ELECTRIC PROJECT IN CZECHO-SLOVAKIA.—A company has been organized with the assistance of the State and the Province of Bohemia which will supply electricity in Prague. The company is capitalized at 180,000,000 crowns and will be known as the Central Electricity Works, with headquarters at Ervenice. The proposed plant, work on which has already started, will be erected near the Edwige lignite field at Ervenice. The initial installation will have a capacity of 45,000 kw. Electricity will be transmitted to Prague at 100,000 volts.

NEWCASTLE, AUSTRALIA, TRAMWAY SYSTEM TO BE ELECTRIFIED. — The state government of New South Wales, Australia, *Commerce Reports* states, has decided to equip the tramway system of the city of Newcastle for electrical operation. The system will cover about 50 miles of tracks in Newcastle and suburbs and will cost about $5,000,000. Power will be furnished by the present 25-cycle electric power plant (a state property) situated within the city limits.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

An agency is desired in the Fiji Islands (No. 5,253) for electrical supplies, general hardware, etc.

Purchase and agency is desired in England (No. 5,255) for instantaneous automatic water heaters.

Purchase is desired in Spain (No. 5,276) for a machine for the reconditioning of worn and flattened electric car wheels.

An exclusive agency is desired in Canada (No. 5,290) for electrical devices or appliances.

An agency is desired in Switzerland (No. 5,314) for new inventions in machinery and electrical novelties.

EQUIPMENT FOR PORT ELIZABETH (SOUTH AFRICA) ELECTRIC PLANT.—Tenders will be received by the Municipal Council, Port Elizabeth, South Africa, until April 16 for a 3,000-kw. turbo-alternator, boilers, coal hoppers, coal conveyors, boiler house, steam and feed-water pipes, etc.

METERS, CABLES AND ACCESSORIES FOR ELECTRIC WORKS, MONTEVIDEO, URUGUAY.—Tenders will be received by the State Electricity Works, Montevideo, Uruguay, until March 15 for 1,500 direct-current and 8,500 alternating-current meters, etc. Tenders will also be received until March 10 for 66,000 m. (about 72,600 yd.) of high-tension cable and accessories.

ELECTRIC GENERATOR AND BOILER FOR JOHANNESBURG PLANT, SOUTH AFRICA.—The Municipal Council of Johannesburg, it is stated, has decided to ask for tenders for equipment for the municipal electric plant, including an 8,000-kw. generating unit, with switchgear, cables, etc., and one 45,000-hp. boiler.

APPROPRIATION FOR EXTENSIONS TO THE VICTORIA, AUSTRALIA, ELECTRICITY SCHEME. — A bill has been adopted by the Victorian House of Assembly providing for an appropriation of £1,576,000 for projects of the State Electricity Commission as follows: For additions to the main works, including power house, etc., at Yallourn (Morwell), to cost £760,000; extensions to the transmission line to the southwest of the state £120,000, for the Sugarloaf hydro-electric project, £50,000, and for an electric scheme in Gippsland, beyond Morwell, £70,000.

New Apparatus and Publications

ARC WELDING. — The Burke Electric Company, Erie, Pa., is distributing bulletin No. 127, covering its electric arc welding equipment.

METALS AND ALLOYS.—Henry Carey Baird & Company, Inc., 2 West Forty-fifth Street, New York City, will soon bring out a new book on alloys, entitled "Metals and Their Alloys," by Charles Vickers.

BALL AND ROLLER BEARINGS. — Pamphlet No. 13 issued by the Hoffman Manufacturing Company, Ltd., Chelmsford, Essex, England, describes the use of "Hoffman" ball and roller bearings on electrical machinery. The Norma Company of America, Anable Avenue, Long Island City, N. Y., is agent for the company in the United States.

LIGHTING DATA. — The Edison Lamp Works of General Electric Company, Harrison, N. J., is distributing bulletins L.D. 110A, L.D. 140, L.D. 141, L.D. 142, L.D. 143 and L.D. 144, entitled "The Lighting of Textile Mills," "The Lighting of Paper and Pulp Mills," "Automobile, Garage and Display Room Lighting," "The Lighting of Woodworking Plants," "Lighting of the Food Industries" and "Street Lighting with Mazda Lamps" respectively.

PULVERIZING MILL.—"Hardinge Conical Mills" is the title of catalog No. 13, section 1, issued by the Hardinge Company, 120 Broadway, New York City, which describes its conical ball and pebble mills and their application to the field of grinding and pulverizing.

TURBOBLOWER.—The B. F. Sturtevant Company, Hyde Park, Boston, is distributing a leaflet describing the "Sturtevant turboblower" installed in the Fall River (Mass.) Gas Works.

BOILER FURNACE ECONOMIES. — Bulletin No. 53 issued by the Quigley Furnace Specialties Company, 26 Cortland Street, New York City, describes and illustrates a method of reconstructing and patching boiler-furnace walls with "Hytempite."

CUPOLA TAPPER AND STOPPER.—The Medart Company, Potomac and De Kalb Streets, St. Louis, is distributing a leaflet covering the "Medart" safety cupola tapper and stopper, recently developed by the company.

OXY-ACETYLENE WELDING AND CUTTING.—The Norman W. Henley Publishing Company, 2 West Forty-fifth Street, New York City, has published the revised and enlarged sixth edition of "Oxy-Acetylene Welding and Cutting," by P. F. Willis.

COAL-HANDLING MACHINERY.—"How Hell Gate Station Handles Coal with Maine Electric Machinery" is the title of bulletin No. 4, issued by the Maine Electric Company, Portland, Me., which describes and illustrates the coal-handling equipment installed in the Hell Gate plant of the United Electric Light & Power Company.

GLOSSARY OF ELECTRICAL TERMS. —The Bureau of Foreign and Domestic Commerce announces a new edition of the "Glossary of Electrical Terms," which has been compiled by the Electrical Equipment Division in co-operation with the Electrical Manufacturers' Council. It has been prepared to conform to changes in the export classification schedule which went into effect on Jan. 8, 1923. This pamphlet is intended solely for reference purposes by exporters when making out their export declarations, so that these will indicate accurately the goods shipped in so far as statistical classifications are concerned.

New Incorporations

THE EAST RAINELLE LIGHT & POWER COMPANY, Rainelle, W. Va., has been incorporated with a capital stock of $25,000 by D. D. Raine, J. W. Gray and J. G. Shewey.

THE KINZUA (PA.) POWER & LIGHT COMPANY has been chartered with a capital stock of $5,000 by Fred H. Smith, H. R. French, Kinzua, and C. C. Flatt, Corydon. The company proposes to supply electricity for lamps, heaters and motors.

THE LAMAR (IND.) LIGHTING COMPANY has been incorporated with a capital stock of $2,500 to supply electricity for lighting purposes. The directors are B. W. Huebschman, Claude R. Martin and Fred P. Keller.

THE BOCARATONE (FLA.) WATER & LIGHT COMPANY has been chartered with a capital stock of $25,000 to generate and distribute electricity, operate water works, gas systems, etc. The officers are: J. McL. Stevens, president; G. H. Howard, vice-president, and W. L. Brown, secretary and treasurer.

THE SMITH RIVER (CAL.) LIGHT & POWER COMPANY has been organized for the purpose of supplying electricity in Smith River. The officers are: C. Romander, president and general manager; Henry Westbrook, Sr., vice-president, and George D. Wood, secretary and treasurer.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

BOSTON, MASS.—The Edison Electric Illuminating Company of Boston has acquired a site at Warrenton and Carver Streets on which it proposes to erect a large substation, from which electricity generated at the station on Summer Street and later from the new Weymouth station, will be distributed in this territory.

LOWELL, MASS.—The chief of the Fire Department has recommended the installation of a new fire-alarm system. The cost is estimated at about $200,000.

TAUNTON, MASS.—The installation of an ornamental lighting system in the business district is under consideration.

WAKEFIELD, MASS.—The local works of the Heywood-Wakefield Company will be equipped throughout for electrical operation. The company has contracted with the commissioners of the municipal electric plant for electricity to operate its plant.

CRANSTON, R. I. — Negotiations are under way between Mayor Arthur Rhodes and the Narragansett Electric Lighting Company for improvements to the street-lighting system.

NORWALK, CONN.—Plans for the proposed hat factory to be erected on Van Zandt Street by the Crofut & Knapp Company, South Norwalk, include a power plant. The cost is estimated at $750,000.

WATERBURY, CONN.—The Connecticut Light & Power Company has issued $4,500,000 in capital stock, part of the proceeds to be used in connection with its 100,000-hp. generating plant at Devon. Later three additional units will be installed to double the capacity of the plant.

Middle Atlantic States

HAMMOND, N. Y.—The Rossie (N. Y.) Electric & Manufacturing Company contemplates extensive improvements to its local plant, including the installation of new generating equipment and the erection of 94 miles of transmission lines.

MEDINA, N. Y.—The Genesee Light & Power Company, Batavia, has acquired the Western New York Utilities Company. Extensions will be made in the transmission system and operations continued under the present name.

NEW YORK, N. Y.—The New York Central Railroad Company is planning to establish a 2,000-kw. substation at Park Avenue and 110th Street for third-rail train service.

NEW YORK, N. Y.—Bids will be received by the Board of Purchase of the City of New York, Room 626, Municipal Building, until Feb. 14 for furnishing weatherproof cable to the Department of Plant and Structures.

NEW YORK, N. Y.—Bids will be received by the Department of Public Welfare, Tenth Floor, Municipal Building, until Feb. 13 for furnishing and installing new partitions, electric wiring and heating on the first and second floors of pavilions 7, 8, 9 and 17, Sea View Hospital, borough of Richmond, city of New York.

SHERMAN ISLAND, N. Y.—The International Paper Company, 30 Broad Street, New York, is planning to build a 25,000-kw. hydro-electric generating plant here.

BLOOMSBURY, N. J.—The New Jersey Power & Light Company, Dover, contemplates extending its service to Bloomsbury and to install a street-lighting system.

PHILLIPSBURG, N. J.—The Board of County Freeholders plans to establish a lighting district in Greenwich Township. Lamps will be installed on all highways.

AVONDALE, PA.—The George F. Lee Coal Company contemplates rebuilding its electrically operated coal breaker recently destroyed by fire, causing a loss of about $250,000.

EGYPT, PA.—The Pennsylvania Power & Light Company will build a transmission line from Laurys to Egypt for power service at local cement mills.

LANCASTER, PA.—Arrangements are being made by the Edison Electric Company to place its wires underground in the business section of the city. The cost is estimated at about $161,000.

PHILADELPHIA, PA.—Among the new buildings to be erected at the University of Pennsylvania is a new central power plant, which will be located on the Schuylkill River front near the South Street Bridge.

PITTSBURGH, PA. — The West Penn Power Company has secured permission to erect transmission lines in portions of Allegheny and Washington Counties.

PITTSBURGH, PA. — Electric power equipment will be installed in the baking plant to be erected by the Ward Baking Company at West Park and Ridge Avenues, to cost about $1,000,000.

RAYSTOWN, PA. — The Penn Central Light & Power Company, Altoona, has been granted permission to acquire the property of the Raystown Light & Power Company. Extensions will be made to the system.

RIDGWAY, PA.—The American Water Works & Electric Company, 50 Broad Street, New York, has acquired the Keystone Power Corporation, operating at Kane, Smethport and vicinity. Extensions and improvements will be made in the system.

SUMMERVILLE, PA. — Arrangements have been made with the Jefferson Electric Company, Punxsutawney, to extend its lines to Summerville. Power will be furnished by the West Penn Electric Company.

BALTIMORE, MD. — The Consolidated Gas, Electric Light & Power Company plans to build an electric switching and operating department on Kloman Street, to cost about $105,000.

MONONGAH, W. VA. (P. O. Fairmont) —The Monongah Fuel Company will install a substation, switchboard room and other electrical departments for mine service.

APPOMATTOX, VA.—Residents of the town have organized a company to establish an electric light plant to replace the one destroyed by fire recently. The sum of $25,000 has been subscribed to the stock of the company.

RADFORD, VA.—The City Council is considering the installation of an ornamental lighting system.

WASHINGTON, D. C.—Plans are being prepared by the Commissioners of the District of Columbia for alterations and additions to the Armstrong Manual Training School, to cost about $500,000.

WASHINGTON, D. C.—Bids will be received by Louis A. Hill, director of the Bureau of Engraving and Printing, Washington, D. C., until Feb. 17 for fifty-eight motor equipments for power plate-printing presses.

WASHINGTON, D. C.—Bids will be received by the Purchasing Agent Post Office Department, until Feb. 14 for 500 three-cell cylindrical flashlight batteries.

North Central States

PONTIAC, MICH. — The Fisher Body Corporation, Detroit, will build a power house in conection with its proposed local plant, to cost about $2,000,000.

AGOSTA, OHIO.—The installation of a local light and power system for commercial service is under consideration.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, City Hall, until Feb. 16 for furnishing turbo-generators, air compressor, vacuum pumps and vacuum cleaning equipment for the Fairmont pumping station, division of water, Department of Public Utilities.

FRANKFORT, OHIO.—Plans are under consideration by the City Council to secure electricity to operate the local system. It is proposed to extend the line from New Holland.

LOWELLVILLE, OHIO.—The Pennsylvania-Ohio Power & Light Company, Youngstown, plans to build an addition to its local plant to increase the output by 15,000 kw.

BROWNSVILLE, KY.—The Rock Asphalt Company, Bowling Green, plans to build a power house in connection with a new plant on the Green River, to cost about $200,000.

LOUISVILLE, KY.—The construction of a joint interurban station at Second and Liberty Streets, to cost about $500,000, is under consideration by the Louisville Railway Company.

MADISONVILLE, KY.—The Kentucky Utilities Company, Louisville, has contracted to furnish electricity here. The municipal power plant will be closed down.

INDIANAPOLIS, IND.—The Indianapolis Light & Heat Company will install a transmission line on Belmont Avenue and other thoroughfares.

CARLYLE, ILL.—Bids will be received at the office of the city clerk, until Feb. 19 for construction of a filtration plant, including two centrifugal pumps with motors, transformer, valves, connections, etc. Dawson & Walraven, Springfield, are engineers.

CHARLESTON, ILL.—The Central Illinois Public Service Company contemplates the construction of a one-story ice-manufacturing and cold-storage plant, 75 ft. x 75 ft., in Charleston. L. D. Roberts, 130 North Sixth Street, Springfield, is engineer for the company.

CHICAGO, ILL.—Plans are being prepared by D. I. Davis and associates, 327 South La Salle Street, for a power plant, to cost about $60,000.

CHICAGO, ILL.—The Woodlawn Business Men's Association has petitioned the City Council for the installation of new street lamps on Sixty-third Street from Jackson Park to South Park. The cost is estimated at $45,000.

CHICAGO, ILL. — An addition will be built to the power house at the Michael Reese Hospital, Twenty-ninth Street and Ellis Avenue. Schmidt, Garden & Martin, 104 South Michigan Avenue, are architects.

FREEPORT, ILL.—The Arcade Manufacturing Company has engaged C. E. Wolfley, architect, Stewart Building, to prepare plans for extensions to its power house, to cost about $35,000.

GRANITE CITY, ILL.—Extensive improvements are being made by the Madison County Light & Power Company, including the erection of a transmission line from Venice to Wool River and East Alton and the installation of new equipment in the generating stations at Edwardsville and Venice. The cost of the work is estimated at about $200,000.

KEWANEE, ILL.—Plans are being prepared for the installation of a municipal electric light plant, to cost about $125,000. Burns & McDonnell, Interstate Building, Kansas City, Mo., are engineers.

CHETEK, WIS.—The Wisconsin Hydro-Electric Company, Amery, will begin work in the spring on the reconstruction of the local system and will also erect heavier wires between Chetek and its two hydro-electric plants at Amery and Colfax.

KENDALL, WIS.—The plant of the Kendall Electric Company has been purchased by the Eastern Wisconsin Electric Company, Sheboygan, which will supply electricity for the local system from its high-tension transmission lines.

MARINETTE, WIS.—Extensive improvements are contemplated by the Menominee & Marinette Light & Traction Company, including extensions to the Rapids power plant, to cost $210,000; improvements to the electric distribution systems of the twin cities, together with the construction of a large substation on Wells Street, Marinette, and that part of the high-tension line in this city, to cost $120,000. The transmission line from Pound to the city limits, connecting the hydro-electric and steam systems, will cost more than $100,000.

MONROE, WIS.—The property of the Monroe Electric Company has been acquired by the Wisconsin Utilities Company, Martintown. The latter company has been granted permission to issue $315,000 in bonds, part of the proceeds to be used for extensions and improvements to the local system.

RACINE, WIS.—The Wisconsin Gas & Electric Company is planning to install additional electrically operated unloading machinery on the river dock property, recently purchased by the company.

SHAWANO, WIS.—The installation of an ornamental lighting system on Main Street is under consideration by the Council.

WEST ALLIS, WIS.—The City Council is considering the installation of an ornamental lighting system on Sixth-eighth Avenue Boulevard and on National Avenue from Forty-seventh to Sixty-sixth Avenue. It is also proposed to establish a brightly lighted street from the northern city limits to Greenfield Avenue.

ST. CHARLES, MINN.—The Minnesota Gold Mining Company contemplates the installation of an electric substation in connection with its proposed ore-reduction plant to cost about $125,000.

BURLINGTON, IOWA.—The Burlington Glass Company plans to build a power house in connection with its proposed local glass works on North Main Street, to cost $250,000.

CEDAR RAPIDS, IOWA.—Plans for the proposed hospital building, to be erected by the Mercy Hospital Association, Sixth and Division Streets, to cost $250,000, include a power house.

KANSAS CITY, MO. — Electric power equipment will be installed in the ice-manufacturing plant to be erected at 4730 Tracy Street by the American Ice Company, to cost about $110,000.

KIRKSVILLE, MO.—A special election will be held on Feb. 24 to vote on the proposal to issue $40,000 in bonds for a municipal electric plant.

EMPORIA, KAN.—The Atchison, Topeka & Santa Fé Railroad Company plans to build a power house in connection with its proposed local repair shops, to cost about $5,000,000.

KANSAS CITY, KAN.—Plans are under consideration for changing the entire street-lighting system from gas to electricity, and also for extensions to the ornamental street-lighting system.

Southern States

CRAMERTON, N. C.—Plans for the proposed local textile mill to be erected by the Mays Mill, Inc., to cost about $1,000,000, include a power house. J. E. Sirrine & Company, Greenville, S. C., are engineers.

CHARLESTON, S. C. — Electric cranes, transportation equipment, etc., will be installed in connection with the proposed municipal pier to be built by the Port Utilities Commission, to cost about $1,000,000.

GRAYSVILLE, GA.—A power plant will be installed in the proposed crushed stone works to be constructed by the Chickamagua Quarry & Construction Company, with an initial capacity of 500 tons per day.

JACKSONVILLE, FLA.—The City Council is considering a bill submitted by the City Commission recommending an expenditure of $850,000, covering a period of three years, for extensions to the municipal electric plant, erection of substations and transmission lines.

MIAMI, FLA.—The Council contemplates calling an election to submit the proposal to issue $400,000 in bonds for extending the street-railway system to the suburbs. C. W. Murray is city engineer.

ST. PETERSBURG, FLA.—The Greater St. Petersburg Land Company plans to install a lighting system on an 800-acre tract now being developed for residential purposes.

GREENVILLE, TENN. — The Tennessee Eastern Electric Power Company Johnson City, will install a new unit at its local hydro-electric station.

COLUMBUS, MISS.—Bids will be received by the State Bond Improvement Commission, Jackson, until Feb. 24, for the construction of a central power house at the Mississippi State College for Women. The cost is estimated at about $70,000.

GULFPORT, MISS.—Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Feb. 21 for an ice-manufacturing and refrigerating plant at the United States Veterans' Hospital, Gulfport, specification 4,780. The equipment will include motor-driven compressors, condensers, etc.

QUANAH, TEX.—The Quanah Light & Ice Company will install additional equipment at its power plant.

SLATON, TEX. — The Texas Utilities Company will make extensions and improvements to the system of the Slaton Light & Power Company, recently acquired.

STAMFORD, TEX. — The Chickasha (Okla.) Cotton Oil Company contemplates the erection of a new local plant, to cost about $150,000. The tentative plans include a power house.

Pacific and Mountain States

ALBANY, ORE.—Extensions and improvements are contemplated by the Mountain States Power Company in the Willamette Valley, including the erection of a transmission line from Prospect to Springfield, to cost about $200,000.

BAKER, ORE. — The Eastern Oregon Light & Power Company is reported to be considering the erection of a steam generating plant, to cost about $200,000, or the purchase of the equipment and business of a power company operating in this vicinity.

HUNTINGTON, ORE. — The Columbia Cement Company, Concord Building, Port-

land, will build a power plant in connection with its proposed local cement manufacturing plant, to cost about $1,000,000.

NEWPORT, ORE.—The property of the Yaquina Electric Company has been taken over by the Lincoln County Light & Power Company, Toledo, recently organized. The local system will be reconstructed and a twenty-four-hour service established. A new substation will also be built.

LOS ANGELES, CAL. — Construction plans which will develop 1,250,000 hp. of electrical energy to serve ten counties in southern California have been announced by the Southern California Edison Company. The work will include as the first step in the large project the erection of a terminal station, to cost $2,000,000, which will be known as the Laguna Bell substation and have a capacity of 165,000 hp. Energy for the new station will be supplied from the Big Creek transmission lines.

LOS ANGELES, CAL. — The County Supervisors contemplate the installation of a lighting system in the Willowbrook section.

LOS ANGELES, CAL. — The Southern California Edison Company plans to erect a transmission line over Anaheim Bay, Seal Beach district.

LOS ANGELES, CAL.—An ordinance has been passed authorizing the installation of an ornamental lighting system on Sunset Boulevard from Stanley Avenue to Vista Street.

PASADENA, CAL.—Extensions are contemplated to the municipal electric plant, including the erection of a step-up substation, cooling towers, etc. The installation of four additional boilers in the generating plant is also planned. The cost of the improvements is estimated at about $300,000.

RIVERSIDE, CAL.—Electric power equipment will be installed in the proposed ice-manufacturing and refrigerating plant, 100 ft. x 100 ft., to be built by the National Ice & Cold Storage Company, Twelfth Street.

SAN FRANCISCO, CAL.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Feb. 27 for 4,200 ft. of electric wire (Schedule 465) and for 7,500 ft. of radio frequency cable (Schedule 480) for the Mare Island Navy Yard.

SAN JOSE, CAL.—The Pacific Gas & Electric Company will make extensions and improvements to its local plant, including the installation of additional equipment, to cost about $100,000.

SMITH RIVER, CAL.—The Smith River Light & Power Company, recently organized, is building an electric plant. Orders, it is stated, have been placed for a generator and two Diesel engines. C. Romander is president and general manager.

WILLITS, CAL. — The State Railroad Commission has granted the Central Mendocino County Power Company permission to purchase the water and electrical distributing system of the Willits Water & Power Company, together with 5,260 acres of watershed lands.

GERLACH, NEV.—Plans have been prepared by Weeks & Day, California Insurance Building, San Francisco, for a town site for the Pacific Portland Cement Company, Pacific Building, San Francisco, to include hotel, cottages, power plant, tramways, etc.

Canada

VANCOUVER, B. C.—The Bridge River Power Company contemplates the construction of a hydro-electric plant near Seton Lake, Lillooet, to develop about 400 000 hp. Electricity generated at the proposed plant will be used to augment the power plants of the Vancouver Power Company at Coquitlam and Stave Lake and will be transmitted to and distributed in Vancouver.

MEAFORD, ONT. — A bylaw has been passed by the Town Council authorizing an agreement with the Hydro-Electric Power Commission of Ontario for the erection of transmission line, to cost about $65,000.

PORT ARTHUR, ONT.—The construction of a third unit at the Nipigon hydro-electric plant, to provide an additional 12,000 hp., is under consideration by the Hydro-Electric Power Commission of Ontario.

TORONTO, ONT.—The Temiskaming & Northern Ontario Railway Company has authorized plans prepared for the electrification of its lines, including the road from North Bay to Cochrane, 250 miles; the Iroquois subdivision, 7 miles, and the Porcupine division, 33 miles, to cost about $10,000,000, with equipment.

Electrical Patents

Announced by U. S. Patent Office

(Issued Jan. 16, 1923)

1,442,474. RECORDING TELEGRAPHIC RECEIVING INSTRUMENT; J. A. Hulit, Chicago, Ill. App. filed Dec. 13, 1920. Adjustment of pen recorders used on tapes.

1,442,487. LOCKING MECHANISM FOR MOTOR VEHICLES; O. A. Lucier, Baltic, Conn. App. filed May 6, 1921. Ignition circuit lock.

1,442,496. ELECTRICAL CONTROLLER; E. W. Seeger, Milwaukee, Wis. App. filed April 13, 1922. Fluid rheostats for induction-motor control.

1,422,508. BURGLAR AND LIKE ALARM SYSTEM; S. G. Adams, Lewisham, England. App. filed May 1, 1922. Combined with telephone system with visual indicator in exchange.

1,442,514. ELECTROPLATING MACHINE; F. J. Bell, Cleveland, Ohio. App. filed April 22, 1922. Adapted for galvanizing wheel rims.

1,442,545. MAGNETIC CHUCK; O. S. Walker, Worcester, Mass. App. filed March 28, 1919. Number of pole pieces in form of parallel, oppositely magnetized strips.

1,442,608. VARIABLE-FIELD DEHYDRATOR; H. C. Eddy, Los Angeles, Cal. App. filed June 25, 1921. Length of electric field automatically increased when current increases.

1,442,648. CORD CONDUCTOR; C. E. Carter, Montreal, Can. App. filed Oct. 23, 1920. Cord connected to exterior resistances for motion-picture machines.

1,442,728. CONTROLLING AND REGULATING APPARATUS; F. W. Meyer, Milwaukee, Wis. App. filed Jan. 13, 1917. Eliminating hunting action in converters by use of electroionic valves.

1,442,770. AUTOMATIC TELEPHONE AND SELECTIVE SIGNALING SYSTEM; T. G. Martin, Chicago, Ill. App. filed Nov. 30, 1907. Relates to systems in which selective ringing on party lines is necessary.

1,442,773. HOMOGENEOUS CRYSTALLINE PRODUCT AND METHOD OF MAKING THE SAME; H. A. Richmond and R. MacDonald, Jr., Niagara Falls, N. Y. App. filed April 25, 1922. Uses electric arc furnace.

1,442,781. REAMPLIFYING SYSTEM; H. W. Nichols, Maplewood, N. J. App. filed July 7, 1921. One element of the feedback circuit of amplifier serves as radio-receiving antenna.

1,442,791. AUTOMOBILE STARTER AND GENERATOR; W. L. Bliss, Niagara Falls, N. Y. App. filed May 27, 1915. Single-unit system.

(Issued Jan. 23, 1923)

1,442,834. APPARATUS FOR WELDING RAILS; G. N. Steigerwald, Hatboro, Pa. App. filed Dec. 16, 1921. Welding rail joints by carbon arc process.

1,442,851. EAR FOR TROLLEY WIRES; G. W. Bower, Schenectady, N. Y. App. filed May 27, 1921. Clamping ear for mine service.

1,442,854. ELECTRIC GENERATOR; J. Burke, Erie, Pa. App. filed Nov. 6, 1919. Constant-current generator for welding apparatus.

1,442,858. ADJUSTABLE TEMPERATURE BATH FOR VISCOSIMETERS; W. Claypoole, Forest Hills, N. Y. App. filed Oct. 27, 1919. Thermo-electric relay controls current.

1,442,868. GAS-TESTING MACHINE; T. R. Errest, Chicago, Ill. App. filed March 3, 1921. Spark test chamber to determine if gas is explosive.

1,442,896. WATCH STAND AND NIGHT LAMP; J. H. Maier, Brooklyn, N. Y. App. filed Nov. 12, 1921. Bulb on stand to illuminate watch dial.

1,442,898. ELECTROMAGNETICALLY CONTROLLED BRAKE; M. E. Neenan and J. J. Neenan, New York, N. Y. App. filed July 23, 1918. For control of elevator apparatus.

1,442,903. SPOTLIGHT; A. P. Paine, New Haven, Conn. App. filed Oct. 28, 1921. Variable-focus flashlight.

1,442,908. TRANSMISSION MECHANISM; W. H. Ripley, Orange, N. J. App. filed Nov. 27, 1916. Gasoline engine, generator and motor for automobile drive.

1,442,910. ELECTRICALLY HEATED VESSEL; A. Steinhardt, Berlin, Germany. App. filed Aug. 29, 1921. Element placed in ceramic material in bottom of container.

1,442,925. ELECTRIC FURNACE; D. De Luca, Cotrone, Italy. App. filed Oct. 13, 1919. Furnace for melting scrap material.

1,442,974. DISTRIBUTOR STAND; T. L. Ryan, Muncie, Ind. App. filed Sept. 8, 1921. Method of making base of table lamps.

1,442,977. ETCHING MACHINE; E. G. Schwuchow and G. F. Johnstone, Chicago, Ill. App. filed Jan. 24, 1921. Electrolytic cell for etching flat material.

1,442,988. CONDUIT CAP FOR ELECTRIC INSTALLATION; W. H. Vibber, New London, Conn. App. filed Nov. 1, 1919. Conveniently secured to building, wall or post.

1,442,999. AUTOMATIC REEL FOR ELECTRIC DEVICES; R. B. Boyle, Kansas City, Mo. App. filed March 3, 1921. Wire between telephone and wall box held taut by automatic winding reel.

1,443,007. CONTROL OF ELECTRIC CIRCUITS; L. M. Clement and A. W. Kishpaugh, East Orange, N. J. App. filed Dec. 2, 1920. Rotating tube-filament rheostat and pressing same control current and insert ammeter in circuit respectively.

1,443,011. ATMOSPHERIC DISTURBANCE-REDUCING MEANS; H. J. J. M. de Regnauld, Toulon, France. App. filed Nov. 3, 1922. Amplitude-limiting arrangements for wireless-telegraph signals.

1,443,024. ELECTRIC FURNACE; R. M. Keeney, Denver, Col. App. filed Sept. 7, 1920. Furnace for smelting cyanide precipitates.

1,443,036. FOOT SUPPORTER AND HEATER; I. Panzam, Turin, Italy. App. filed Aug. 23, 1921. Electric heater for automobiles.

1,443,066. TRANSMISSION APPARATUS; E. Belin, Paris, France. App. filed July 31, 1913. Transmitting graphic documents over wires.

1,443,073. DYNAMO-ELECTRIC MACHINE; C. F. Gilchrist, Toledo, Ohio. App. filed June 25, 1917. Automobile generator and starting motors built from same material as far as practicable.

1,443,089. ELECTRIC HAND LAMP; D. Pepper, Philadelphia, Pa. App. filed Aug. 15, 1921. Means for changing focus, and space also provided within lamp for holding two reserve lamps.

1,443,091. METHOD FOR TRANSFORMING THE KINETIC ENERGY IN GASES INTO ELECTRICAL ENERGY AND MANNER FOR UTILIZING THE LATTER FOR CARRYING OUT GAS REACTIONS; C. Petersen, Christiania, Norway. App. filed Jan. 4, 1919.

1,443,106. USHER'S SIGNAL; J. J. Walsh, Syracuse, N. Y. App. filed Sept. 30, 1921. Flashlight to indicate number of vacant seats.

1,443,123. ELECTRIC WELDING APPARATUS; G. Giorgini, Greco Milanese, Italy. App. filed Feb. 16, 1921. Machines for welding metal rims.

1,443,165. ELECTRIC SIGNALING AND CONTROLLING APPARATUS; R. P. Brown, Philadelphia, Pa. App. filed July 20, 1918. Thermo-electric relay for controlling electric furnace temperatures.

1,443,166. FURNACE-REGULATING APPARATUS; R. P. Brown, Philadelphia, Pa. App. filed July 31, 1918. Changing furnace temperature at predetermined rate.

1,443,205. ELECTRICAL APPARATUS; J. Bijur, New York, N. Y. App. filed July 3, 1919. Control device for charging storage batteries.

1,443,209. RADIO RECEIVING SYSTEM; B. Bradbury, Schenectady, N. Y. App. filed Sept. 15, 1920. Apparatus for very sharp turning.

1,443,214. MOTOR-DRIVEN APPARATUS; J. Clayton, Coventry, England. App. filed Aug. 26, 1919. Manufacture of artificial silk similar to Topham system.

1,443,251. AUTO SAFETY SIGNALING DEVICE; J. W. Elardo, Fredonia, N. Y. App. filed July 15, 1921. Rear direction signal.

1,443,254. FIRE-ALARM HYDRANT; E. E. Ferguson, Portsmouth, Va. App. filed Jan. 6, 1921. Apparatus for simultaneously turning in alarm and opening water valve, the valve being provided with hose.

1,443,321. ELECTRIC ACCUMULATOR OR STORAGE BATTERY; H. Leitner, London, England. App. filed June 23, 1922. Each element comprises one or more pencils of active material separated by porous material.

1,443,322. ELECTRIC ACCUMULATOR OR STORAGE BATTERY; H. Leitner, London, England. App. filed June 23, 1922. Cellular structure for pencil electrodes.

(Issued Jan. 30, 1923)

1,443,357. AUDIBLE SOUND INSTRUMENT; B. F. Gardner, Chicago, Ill. App. filed Aug. 4, 1921. Determining quantity of oil and water by means of telephone receiver.

1,443,361. SYSTEM FOR THE TRANSMISSION OF RADIANT ENERGY; J. H. Hammond, Jr., Gloucester, Mass. App. filed July 27, 1917. High degree of secrecy may be maintained.

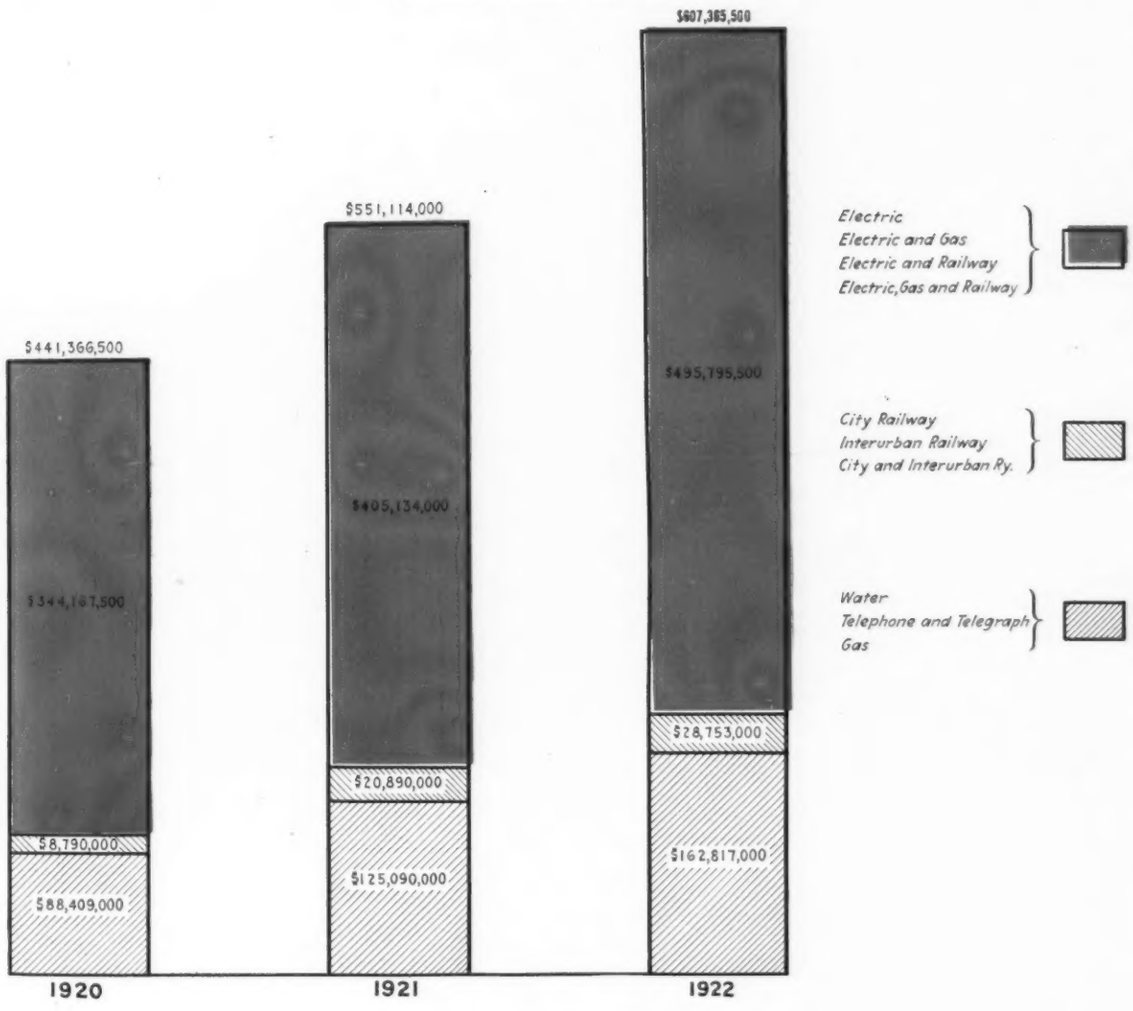
1,443,419. BURNISHING MACHINE; B. S. Lee, Beverly, Mass. App. filed May 6, 1921. Electrically heated setter for burnishing sole edges of boots and shoes.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

Steady Increase in Public Utility Bond and Stock Issues

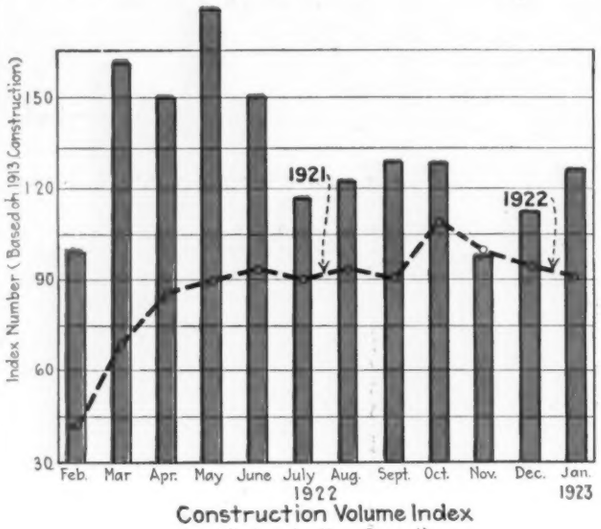
(Blocks of $500,000 and over)



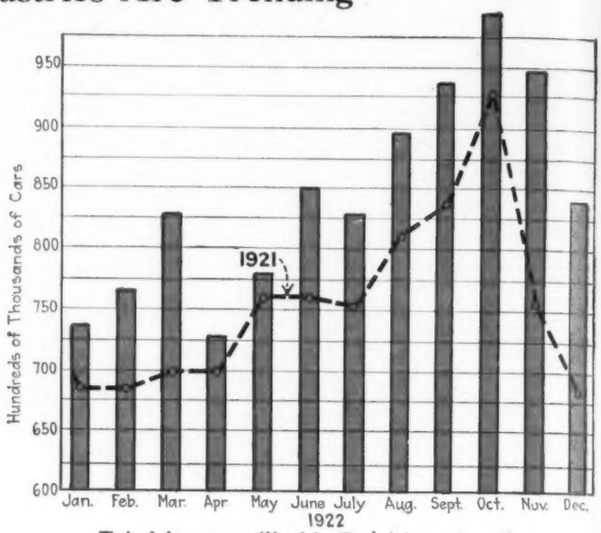
Economic Stability of the Industry

PUBLIC utility financing during the past three years places that industry in a unique position. During 1921, when business was struggling in the slough of depression, the financing of industry at large was at an extremely low ebb. Statistics show that the financing done in the United States by industrials during 1921 was only about half of that reported for 1920 and about three-quarters of the 1922 financing. Public utilities, especially the electric light and power branch, were an outstanding exception to this decrease in the absorption of new money. Bond and stock issues of central-station companies during 1921 were about 18 per cent in excess of the 1920 financing, and 1922 was about 23 per cent over 1921. The high cost of money during the period of depression, while undoubtedly holding back much-needed extensions to the generating, transmission and distribution equipment of the operating companies, yet was not sufficient to retard materially the historic continuous growth of the industry. Data compiled by National City Company.

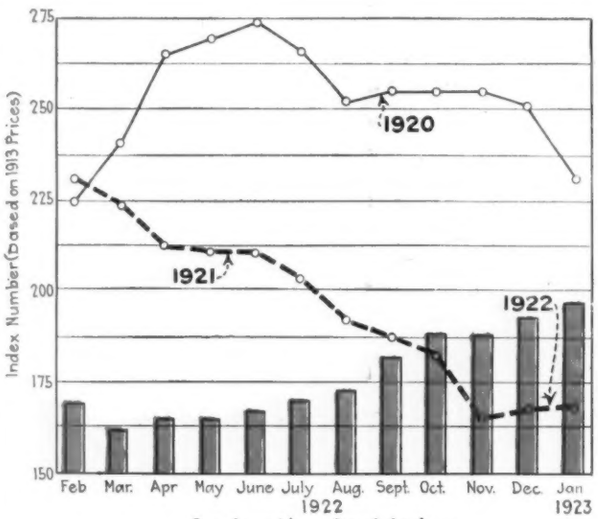
How the Primary Industries Are Trending



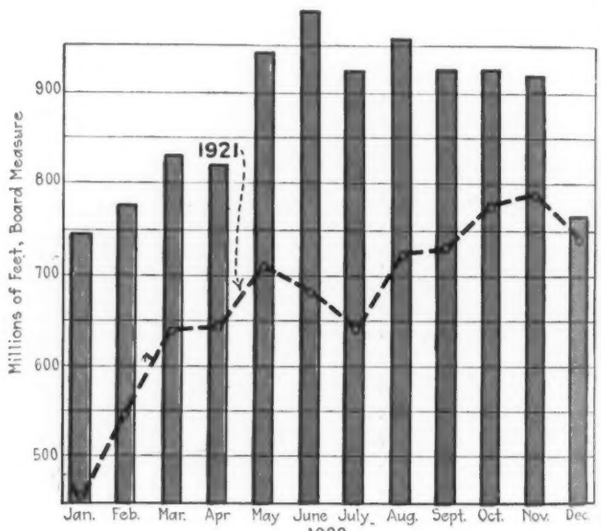
Construction Volume Index
(Engineering-News Record)



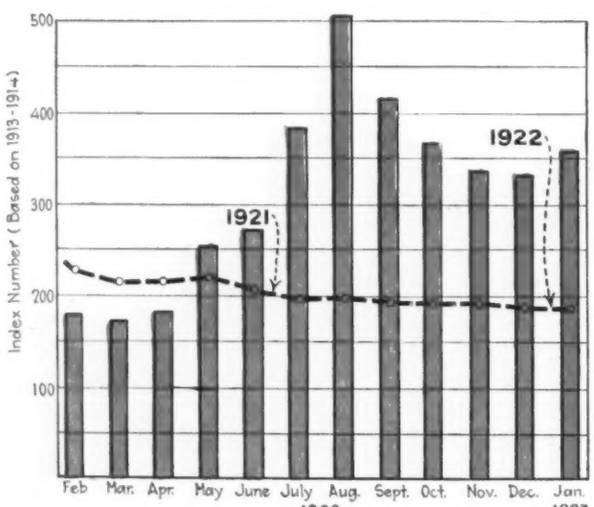
Total Average Weekly Freight-car Loadings



Contruction Cost Index
(Engineering-News Record)



Lumber Production
(Yellow Pine and Douglas Fir)



Price of Bituminous Coal at Mines
(Coal Age)

Volume of Construction Points to Record Electrical Sales

ONE of the most outstanding economic facts of the present winter is the non-appearance of the normal seasonal drop in volume of construction under way or contracted for. Normally the fall and winter months witness a low ebb in construction. Last November did witness a material drop, but the increased volume reported during December and January points clearly to the year 1923 as one of unprecedented new construction. A reliable survey indicates that the total volume of building construction during 1923 will exceed five billion dollars, of which only about one-fifth will be absorbed in dwellings and apartment houses. Expansion in industry in general will call for new construction in excess of a half billion dollars. These data furnish another indicator of the record volume of business which is before the electrical industry both for apparatus and supplies and also for the sale of electrical energy.